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FEBRUARY 1999

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We Rate Schwab, E-Trade, and Other Top Online Firms

Natural-Born Virus Killers

Which Antivirus Packages Will Keep Your PC Protected?

From Today to 2002 The Future of the PC

Revolutionary CPUs
Displays to Die For
New Net Technologies

How do I make my personal computer really personal?

Compaq Presario® 5600-450

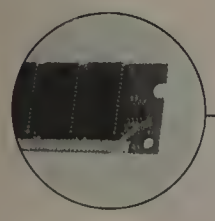
intel inside pentium® II PROCESSOR

COMPAQ

Easy. Have Compaq build one for you.

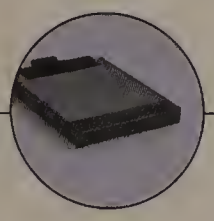
Who knows your computer needs as well as you? Nobody — so shouldn't you be the one to decide what goes into yours? When you order these Presario Internet PCs, you're in the driver's seat. You choose how much memory you want, hard drive size, whether you want a CD-ROM drive or DVD, advanced graphics, video memory, even the type of monitor you want. And you don't need a degree in computer engineering to build the computer that best suits your needs — we'll build it for you. And if you're not sure what features are best for you, we'll help you decide. Just call Compaq, visit our website, or stop by a Compaq *Built For You Custom PC Center* at select retailers. **Bring the world's best-selling computer home today.**

Here are some of the features we can personalize for you:



Memory

Speed up performance by choosing from 64 MB to a whopping 384 MB of Synchronous DRAM.



Hard Drive Size

Whether you're writing the great American novel or just surfing the Net, we've got the hard drive size that's right for you.

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You can choose from the latest Intel® Pentium® II Processors, including the new 450 MHz.

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RadioShack,
RCS Computer Experience,
Sears, Staples,
State Street Discount,
The Wiz,
Tiger Direct,
Tops Appliance City,
T-Zone.

Buy one of these computers and get 50 free hours on the Net.* Here

Compaq Presario 1800-266

$2,099
-$100 mail-in rebate**

$1,999

Base price includes:
- Intel® Pentium® II Processor, 266 MHz
- 13.3" TFT Active Matrix Display
- 32 MB SyncDRAM expandable to 160 MB
- 4.0 GB UltraDMA Hard Drive[1]
- 24X Max CD-ROM Drive[3]
- 56K ITU V.90 Modem[2]
- Smart Lilon Battery
- 512 KB L2 Pipeline Burst Cache
- 256-bit Accelerated Graphics w/2.5 MB VRAM
- Microsoft® Featured Home Collection
- Microsoft Windows®98

Personalize it by choosing:
- 64 MB SyncDRAM: Add $100
- Additional Smart Lilon Battery: Add $129
- Mobility Auto Adapter: Add $129

Compaq Presario 1800-300

$2,599
-$100 mail-in rebate**

$2,499

Base price includes:
- Intel Pentium II Processor, 300 MHz
- 13.3" TFT Active Matrix Display
- 64 MB SyncDRAM expandable to 160 MB
- 4.0 GB UltraDMA Hard Drive[1]
- 2nd-Generation DVD-ROM Drive[6]
- 56K ITU V.90 Modem[2]
- Smart Lilon Battery
- 512 KB L2 Pipeline Burst Cache
- 256-bit Accelerated Graphics w/2.5 MB VRAM
- Microsoft Featured Home Collection
- Microsoft Windows98

Personalize it by choosing:
- 96 MB SyncDRAM: Add $100
- 6.4 GB Hard Drive:[1] Add $200
- Brief Carrying Case: Add $119

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$2,999
-$100 mail-in

$2,89

Base price include
- Intel Pentium II P
- 13.3" TFT Active
- 96 MB SyncDRA
- 6.4 GB UltraDMA
- 2nd-Generation D
- 56K ITU V.90 Mo
- Smart Lilon Batte
- 512 KB L2 Pipeli
- 256-bit Accelera w/2.5 MB VRAM
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- Microsoft Window

Personalize it by cl
- 160 MB SyncDRA
- Executive Leather Add $200
- Port Replicator: A

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- Single-head thermal inkjet technology
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  Up to 1½ pages per minute color
- Paper tray holds up to 30 sheets

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- Personalize your desktop by choosing an Iomega Zip Built-In™ Drive: Add $79
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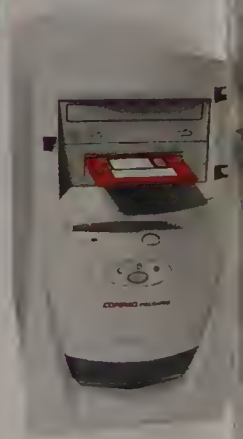
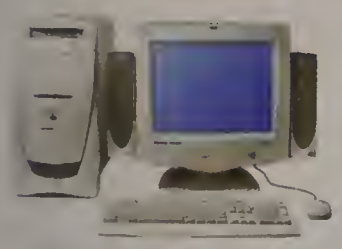
- One Zip disk equals the capacity of 70 floppies
- Reliable backup of your important stuff
- Easily carry files between work and home
- Plus: Buy a Zip 10-pak for only $99 — so everyone in the family can store their own stuff



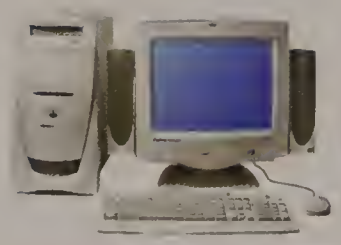
intel inside pentium® II PROCESSOR

All prices shown are Compaq Direct selling price after applicable rebate. Prices shown do not include applicable sales tax and shipping. Products and **offered when Compaq Easy Internet Access is chosen from Compaq Internet Setup. The 50 free hours must be used over a 30-day pe trial of Compaq Easy Internet Access. Rebate offer valid only in the USA and expires 4/30/99. See rebate coupon included with produ** rates are currently unknown, may not reach 56 kilobits per second (Kbps), and will vary with line conditions. [3]24X Max CD-ROM data transfer rates ma DVD-ROM Drives run at a higher maximum transfer rate of up to 2.76 MB/s compared to 1st-Generation DVD-ROM Drives which run at a maximum tr compliant digital sources. Availability of G.Lite/56K V.90 services will vary by region and Internet Service Provider (ISP), and may differ from V.90 ISP s site service during the first 90 days of ownership. Labor for notebook systems is pick-up service. Compaq is not liable for pictorial or typographical erro are registered trademarks of Intel Corporation. Product and company names mentioned herein may be trademarks and/or registered trademarks of oth

t a few of the hundreds of possible combinations:



(Shown with Presario MV700 Monitor)



(Shown with Presario MV700 Monitor)

(Shown with Presario MV700 Monitor)

0-300

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250
Case:

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Compaq Presario 5600i-450

$2,549

Base price includes:

- Intel Pentium II Processor, 450 MHz
- 13.0 GB UltraDMA Hard Drive[1]
- 6X DVD-ROM Drive[5]
- 128 MB SyncDRAM expandable to 384 MB
- Diamond Viper 550 AGP w/16 MB SDRAM
- Diamond Monster Sound MX300 PCI Audio Card
- 56K ITU V.90 Modem[2]
- 10 Mbps Ethernet Port, Cable Modem Ready
- JBL Pro Studio w/Dual Subwoofers (160 watts)
- Digital Creativity Imaging Center
- Iomega Zip Built-In™ Drive
- Microsoft Featured Home Collection
- Microsoft Windows98
- Compaq V910 19" Monitor (18.0" VIA)

Personalize it by choosing:

- 256 MB SyncDRAM: Add $250
- 16.8 GB UltraDMA Hard Drive:[1] Add $89
- Presario FP700 Flat Panel Monitor (15.0" VIA): Add $445

Compaq Presario 5600i-450

$2,299

Base price includes:

- Intel Pentium II Processor, 450 MHz
- 13.0 GB UltraDMA Hard Drive[1]
- 32X Max CD-ROM Drive[4]
- 128 MB SyncDRAM expandable to 384 MB
- 2X AGP Graphics w/8 MB SGRAM
- Aureal 8820 PCI Audio Card
- 56K ITU V.90 Modem[2]
- Digital Creativity Imaging Center
- 10 Mbps Ethernet Port, Cable Modem Ready
- JBL Pro Speakers
- Microsoft Office 97 Small Business Edition
- Microsoft Windows98
- Compaq V910 19" Monitor (18.0" VIA)

Personalize it by choosing:

- 6X DVD-ROM Drive:[5] Add $59
- Iomega Zip Built-In™ Drive: Add $79
- 1.5Mb Max Digital Modem:[8] Add $99

Compaq Presario 5600i-450

$1,999

Base price includes:

- Intel Pentium II Processor, 450 MHz
- 13.0 GB UltraDMA Hard Drive[1]
- 6X DVD-ROM Drive[5]
- 96 MB SyncDRAM expandable to 384 MB
- 56K ITU V.90 Modem[2]
- 2X AGP Graphics w/8 MB SGRAM
- Aureal 8820 PCI Audio Card
- 10 Mbps Ethernet Port, Cable Modem Ready
- JBL Pro Speakers
- Microsoft Featured Home Collection
- Microsoft Windows98
- Compaq V720 17" Monitor (15.9" VIA)

Personalize it by choosing:

- Diamond Viper 550 AGP w/16 MB SDRAM: Add $50
- Digital Creativity Imaging Center: Add $39
- Diamond Monster Sound MX300 PCI Audio Card & JBL Pro Premium Speakers w/Subwoofer: Add $88

Compaq Presario 5600i-400

$1,799

Base price includes:

- Intel Pentium II Processor, 400 MHz
- 13.0 GB UltraDMA Hard Drive[1]
- 6X DVD-ROM Drive[5]
- 64 MB SyncDRAM expandable to 384 MB
- 56K ITU V.90 Modem[2]
- 2X AGP Graphics w/8 MB SGRAM
- Aureal 8820 PCI Audio Card
- 10 Mbps Ethernet Port, Cable Modem Ready
- JBL Pro Speakers
- Digital Creativity Imaging Center
- Microsoft Featured Home Collection
- Microsoft Windows98
- Compaq V720 17" Monitor (15.9" VIA)

Personalize it by choosing:

- 128 MB SyncDRAM: Add $100
- Iomega Zip Built-In™ Drive: Add $79
- 1.5Mb Max Digital Modem:[8] Add $99

Compaq Presario 5600i-350

$1,699

Base price includes:

- Intel Pentium II Processor, 350 MHz
- 13.0 GB UltraDMA Hard Drive[1]
- 32X Max CD-ROM Drive[4]
- 128 MB SyncDRAM expandable to 384 MB
- 56K ITU V.90 Modem[2]
- 2X AGP Graphics w/8 MB SGRAM
- Aureal 8820 PCI Audio Card
- 10 Mbps Ethernet Port, Cable Modem Ready
- JBL Pro Speakers
- Microsoft Office 97 Small Business Edition
- Microsoft Windows98
- Compaq V720 17" Monitor (15.9" VIA)

Personalize it by choosing:

- 16 GB UltraDMA Hard Drive:[1] Add $89
- Compaq V910 19" Monitor (18.0" VIA): Add $170
- Diamond Viper 550 AGP w/16 MB SDRAM: Add $50

Compaq Presario 5600-350

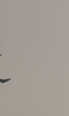
$1,599

Base price includes:

- Intel Pentium II Processor, 350 MHz
- 10.0 GB UltraDMA Hard Drive[1]
- 6X DVD-ROM Drive[5]
- 64 MB SyncDRAM expandable to 384 MB
- 56K ITU V.90 Modem[2]
- 2X AGP Graphics w/8 MB SGRAM
- Diamond Monster Sound MX300 PCI Audio Card
- 10 Mbps Ethernet Port, Cable Modem Ready
- JBL Pro Premium Speakers w/Subwoofer
- Microsoft Featured Home Collection
- Microsoft Windows98
- Compaq V720 17" Monitor (15.9" VIA)

Personalize it by choosing:

- 128 MB SyncDRAM: Add $100
- 13.0 GB Hard Drive:[1] Add $45
- Iomega Zip Built-In™ Drive: Add $79



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d in U.S. only. Actual retail price may vary. Specifications and prices are subject to change or cancellation without notice. Not all Compaq Presario models available in all retail stores. ***50 free hours of Internet access is initial setup. A valid credit card is required to initiate service, although no charges will be incurred until the 50-hour trial has expired. **$100 mail-in rebate from Compaq upon activation of this free itional terms and conditions.** [1]For hard drives, GB = billion bytes. [2]ITU V.90 modems are designed only to allow faster downloads from K56flex or V.90 compliant digital sources. Maximum achievable download transmission n 1500 to 3600 KB/s. [3]32X Max CD-ROM data transfer rates may vary from 1800 to 6000 KB/s. [4]The 6X DVD-ROM Drive transfer rate is up to 8,115 KB/s compared to 1,352 KB/s for 1X DVD-ROM Drives. [5]2nd-Generation of up to 1.348 MB/s. One year parts and labor. [6]G.Lite/56K V.90 updates may be downloaded from the Compaq Web site when available. The G.Lite/56K protocol is designed to allow faster downloads from G.Lite/56K V.90 laximum achievable download transmission rates with G.Lite/56K V.90 are currently unknown and may not reach 1.5Mb, and will vary with line conditions and distance. Labor for desktop systems is carry-in service with on- dvertisement. Compaq, the Compaq Logo, and Presario registered in U.S. Patent and Trademark Office. Microsoft, MS, and Windows are registered trademarks of Microsoft Corporation. Intel, the Intel Inside Logo, and Pentium ies. **Call Compaq Monday-Friday 7:00am-11:00pm (CST), Saturday and Sunday 7:00am-7:00pm (CST).** ©1999 Compaq Computer Corporation. All rights reserved.

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PC WORLD

FEBRUARY

VOLUME 17 ◆ NUMBER 2

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Shoe-box PCs, 700-MHz CPUs, wafer-thin flat-panel displays, blindingly fast Net connections. The next three years promise dramatic changes in the way PCs look, feel, and act. Here's a sneak peak, plus a time-line guide to over two dozen new chips coming soon to a computer near you.

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REVIEW When you least expect it, you're infected. Today's viruses are smarter, stealthier, and more destructive than ever before. Defend yourself with the most merciless of seven top virus-killing packages.

143 **TAKING DVD FOR A SPIN**
REVIEW DVD-ROM is tempting: 4.7GB of data, brisk performance, and of course those movies. Too bad so little business software is written for it. Still, DVD-ROM's the technology of choice for most new PCs. Our tests identify which companies make top models.

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167 **PICTURE PERFECT**
REVIEW Want to improve your image? Whether you're tinkering with product photos on your company Web site or doctoring a picture of your home for a real estate brochure, photo-editing software can do the job. We review nine easy-to-use packages to find the ones that help your pictures look their best.

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SPECIAL REPORT

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online Point, click, trade. Could it really be that easy? We bought and sold stock at Schwab, E-Trade, and six other popular online brokerages and discovered which traders were on the money.

COVER *3D computer rendering of future PC courtesy of GloDesign of Irvine, California.*

ICONS: JEFFREY PELO

TOP OF THE NEWS

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A $20 preview beta of Office adds Publisher, FrontPage, and other popular applications to its quiver, along with a slew of Web features and a few dubious "improvements."

52 TAKEN TO TAX
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58 WHY SOFTWARE COSTS ARE STILL GOING UP
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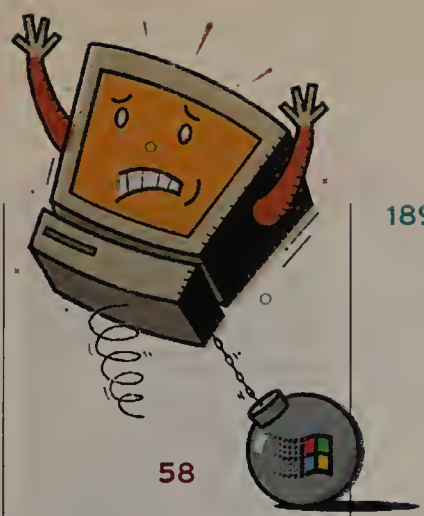
62 DVD-RAM: FAST, VAST, REWRITABLE
Finally, you can record and read up to 5.2GB on a single platter. But watch out for compatibility gotchas.



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TOP 100

189 ARE STORE-BOUGHT PCs ENDANGERED SPECIES?
TOP 100 Long envious of mail-order stars like Dell, Gateway, and Micron, old-timers IBM and Compaq launch direct-to-buyer PC lines. The results: more choices and cheaper computers.

online

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TOP 20 Steep discounts make for a near-sweep by PII-450s. One notable exception is Dell's chart-topping Optiplex GX1 400, a corporate 400-MHz PII.

202 BUDGET DESKTOPS
TOP 20 From Unicent's spartan $999 Avanta E333 to Micron's loaded, network-ready ClientPro 400 for $1999, this month's economy machines run the gamut.

212 NOTEBOOKS
TOP 10 Dell's Latitude CPi D300XT continues as top power notebook, while a lightweight Pentium II-266—Unicent's $1899 Voyager 1212—is new budget champ.

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TOP 10 The best budget PC, Quantex's new speed-demon QP6/333 M-1c, costs $1099—dirt cheap, even for a Celeron.

218 COLOR PRINTERS
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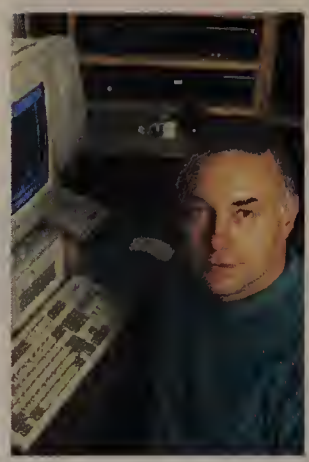

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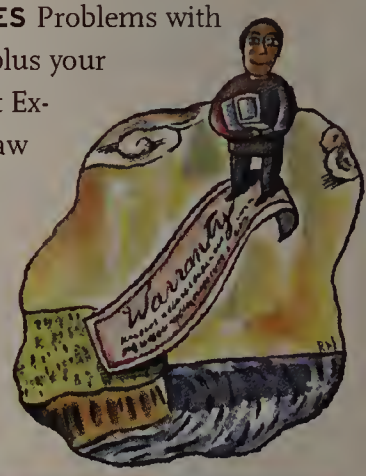

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PCW ONLINE

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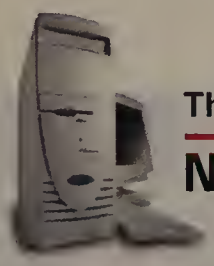

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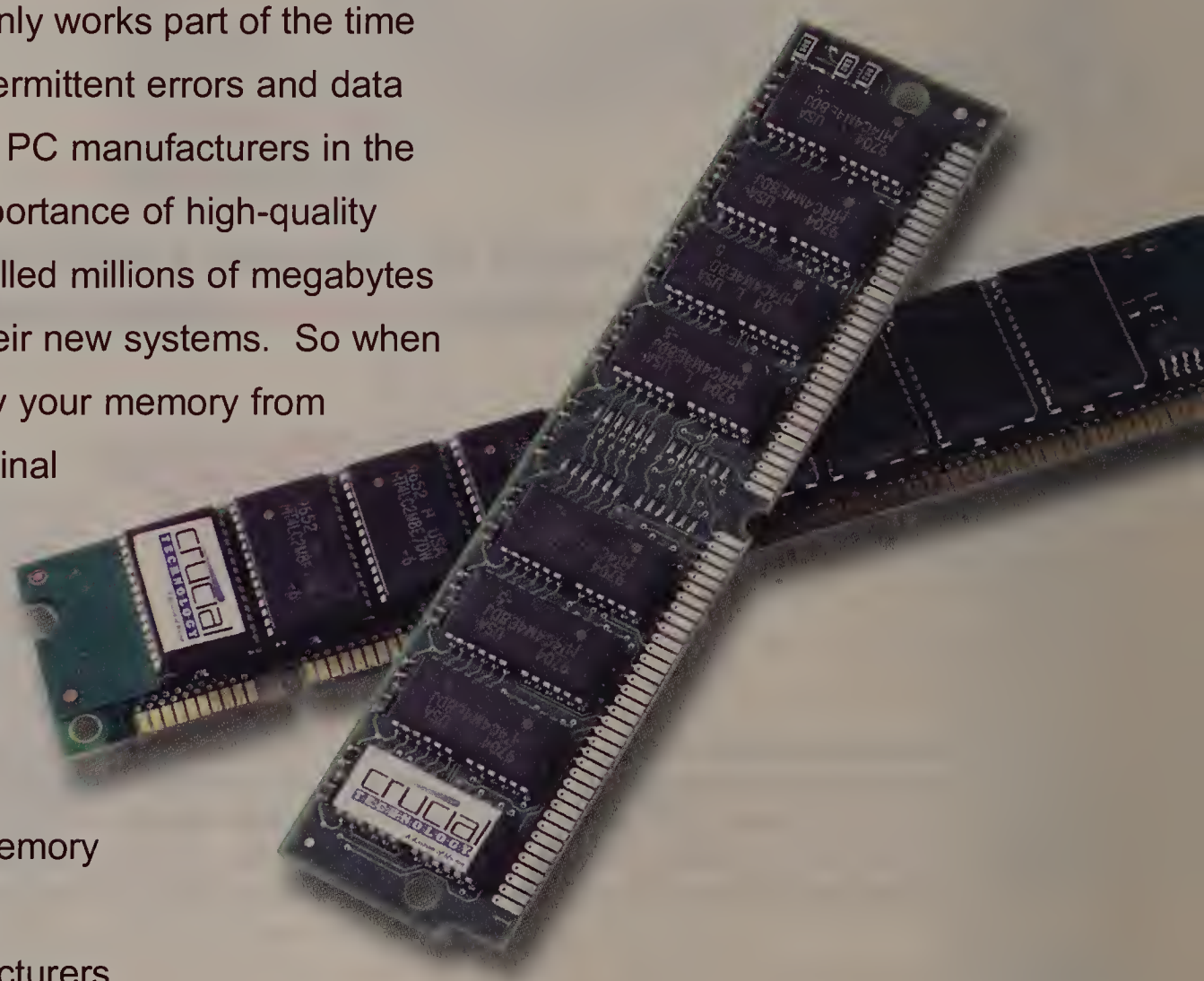

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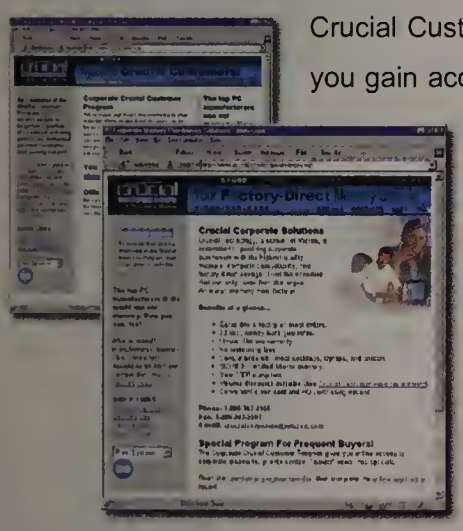

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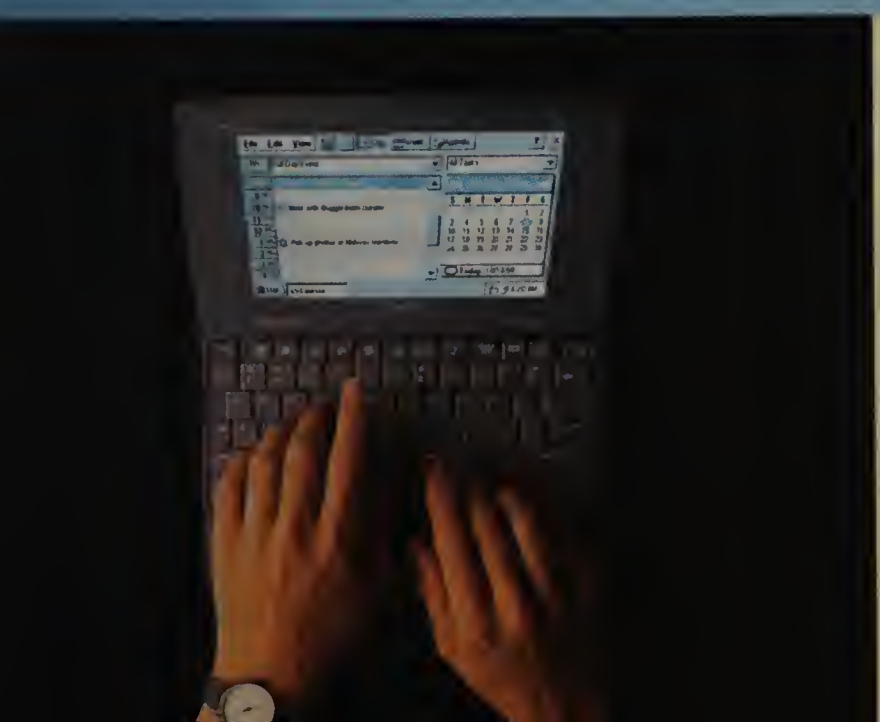

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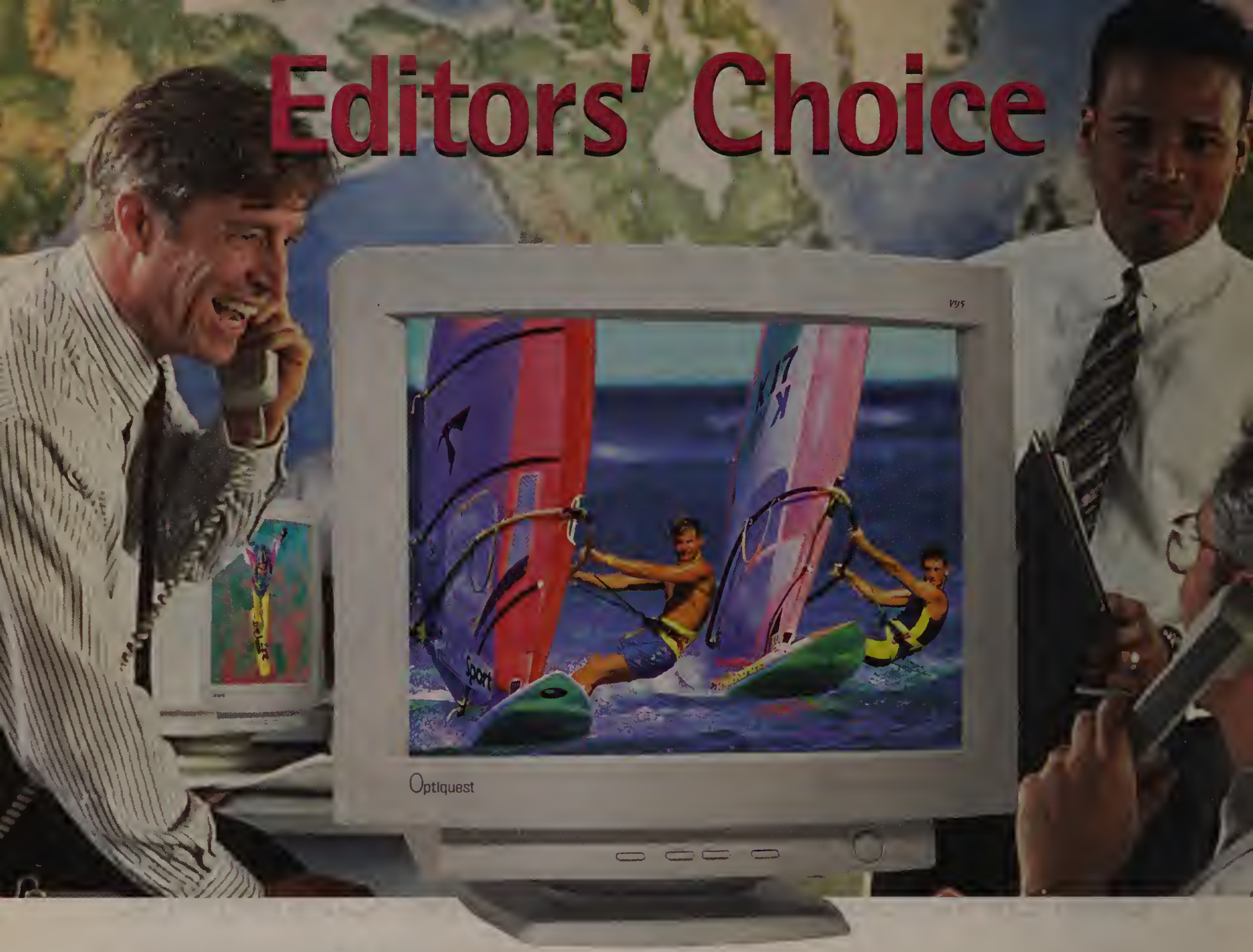

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Needed in PCs: Less Noise

PERSONAL COMPUTERS CONTINUE to improve at a breakneck pace. Clock speeds are pushing 500 MHz. Prices for well-configured systems are breaking the $1000 barrier. And specifications for future machines promise continued blazing progress. For a comprehensive survey of the PC's bright future, read Michael Desmond's "Your PC in the New Millennium" on page 104.

Already we can glimpse the future in the new crop of sub-$1000 LCD monitors for desktop PCs, and a wider selection of flat displays is on the horizon. Candescent Technologies is building a factory in San Jose to make what it calls ThinCRTs—8mm-thick displays with separate microscopic electron guns for every pixel.

Reflective semiconductors may also figure in future monitors. These technological marvels make pixels by bouncing light off microscopic mirrors on the surface of silicon chips. The leader is Texas Instruments with its digital micromirror device, already common in presentation projectors. Other contenders include Silicon Light Machines with its grating light valve technology, and Colorado Microdisplay with its DNLCOS (dynamic nematic liquid crystal on silicon). Whichever technology wins, the triumph of flat displays seems assured. The elegance of their design will call for other changes.

A five-fan PC has no more chance of landing in a family room than a B-29 bomber—and is almost as noisy.

FLAT SCREENS WANT FLAT SPEAKERS

PUT BESIDE FLAT DISPLAYS, today's fat speakers look like guests at the wrong party. Affordable flat speakers are beginning to appear; the most intriguing employ NXT technology from New Transducers in the United Kingdom. The radical design features flat panels ranging from 3mm to 25mm thick that vibrate randomly rather than moving like pistons. They require no enclosures. Other possibilities for flat speakers include cost-reduced versions of older technologies such as ribbons and planar magnetics. PC speakers using NXT flat panels are already available from several companies, including NEC, Gallant Computer, Kodel, and Benwin. Harman International is a major American licensee of NXT technology. Planar magnetic speakers are available from Monsoon Audio Systems. May the best sound win!

But neither the look nor the sound of speakers will matter if the PC itself drowns them out. When trying out new flat speakers on a system at home, I could draw few conclusions because of noise from the PC's two fans. Despite the obvious problem, noise draws little mention in Intel's and Microsoft's specs for future PCs. Intel's "Anywhere in the Home" literature says nothing about noise, and Microsoft's OnNow specification focuses on quieting the PC while it sleeps. The mundane problem of minimizing fan noise is clearly a low priority for industry leaders. Do they think information appliances must sound like dishwashers or refrigerators?

Regardless, fan noise is more than a nuisance. It interferes with any activity requiring close attention to sound. This limits the uses of the future PC in both home and business. Watching DVDs and listening to music require clear sound. So will the use of Internet telephones and videoconferencing systems. The industry would do well to heed the admonition given in *Peter Pan:* "A little less noise there!"

LIKE A B-29—OR WORSE

THE OPPOSITE SEEMS to be happening. Since microprocessors get hotter as clock speeds rise, PCs inevitably require more cooling, not less. One new Katmai-equipped PC will have four fans, matching the number of propellers on an old B-29 bomber.

The fans, noise and all, don't keep me from wanting the Katmai system. I might even add a graphics card that carries yet another fan. But fan noise would limit the system's use. The noise level would be acceptable only underneath the laser blasts, engine roars, and crowd noise of computer games. The five-fanner would be too loud beside an office desk, and it would have no more chance of landing in a family room than a B-29.

Most of us can't do much about PC noise. Few will sacrifice speed for silence, or surround our systems with acoustic baffles in decorator colors. The do-it-yourselfer has not yet been born who will move the PC's fans outdoors and run an air duct inside the building to the machine. Products like the HushKit from Silent Systems can help, but not many users will personally replace power supplies. The noise cancellation technologies used in special headphones on airplanes may hint at a solution.

One thing is coming through loud and clear. If the vaunted technical geniuses of the computer industry can't solve the noise problem, the barrier to wider use of the PC may be measured not in megahertz, megabytes, or dollars, but in decibels.

Phil Lemmons is editorial director of PC World. ■

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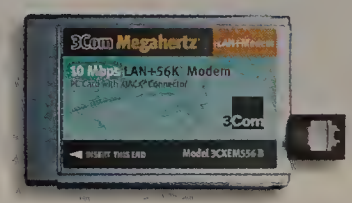

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YOUR TAKE ON: Stolen software ◆ Apple's iMac ◆ Our cranky columnist

COUNTERFEIT SOFTWARE

CHRISTINA WOOD'S article ["Is Your Software Stolen?" December] was an eye-opening exposé of the seedy underworld of mass counterfeit-for-profit operations. But it neglected one key reason why such a big market exists for these stolen goods: People have concluded that the "fair market value" of legitimate software isn't fair. I hear this argument with increasing frequency: If a company charges money for buggy crashware that cannot do what it's supposed to do with reasonable reliability, who is stealing from whom?

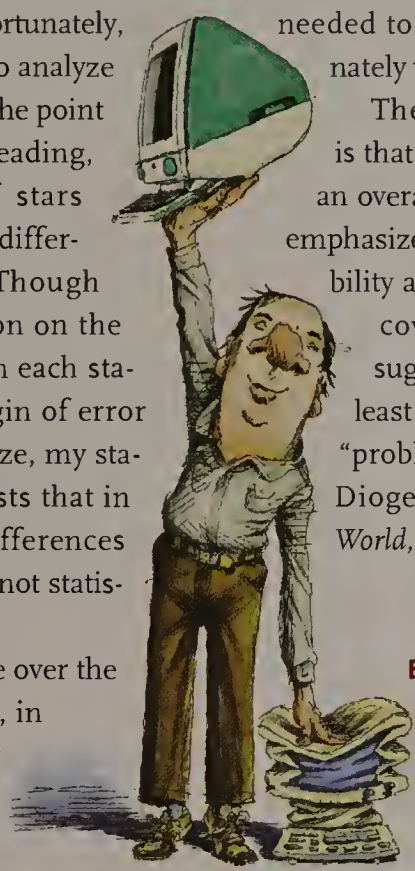
Every "End User License Agreement" I've seen declares that the vendor is unconditionally excused from any and all responsibility for the quality of its software. Unless users can get better assurance that the higher price of legitimate software buys real, functional value, the pirates will flourish. Yes, strictly speaking, what they're doing is illegal. So was dumping all that tea into Boston Harbor.

Michael Evans, Los Angeles

PC RELIABILITY AND SERVICE

THE USER SURVEY for your November cover story on PC reliability and service could have told the world some very useful things and addressed some serious industry problems. Unfortunately, the star system it used to analyze the data is simplistic to the point of being seriously misleading, since the number of stars means something very different in each category. Though you give no information on the number of responses in each statistical cell, nor a margin of error based on that sample size, my statistical intuition suggests that in many categories the differences between the ratings are not statistically meaningful.

I am also left to puzzle over the result that, for example, in the five-star category for home computers, just under 40 percent of the PCs had at least one problem requiring repair, yet in the worst (two-star) category there were less than 3 percent problems per year, leading to the absurd conclusion that the average PC in your survey was about 11 years old. Such discrepancies needed to be addressed, but unfortunately were not.



The saving grace of the article is that none of the systems received an overall five-star rating. The article emphasizes the seriousness of the reliability and service problems, but the cover headline unfortunately suggests that you've uncovered at least one manufacturer that sells a "problem-free" system. Alas, even Diogenes, masquerading as *PC World*, cannot find one.

Thomas P. Vogl
West Tisbury, Massachusetts

Editors' response: Our star rating system is designed to show relative rankings for each company's PC reliability and service. We devised the ▶

HOT BUTTON

Thumbs-Down iMac Review Brings Out Apple's Defenders

IN THE ARTICLE criticizing Apple's iMac speed claims ("iMac vs. Pentium: No Points for Good Looks," *Top of the News*, December), your speed comparisons are incomplete. I've seen the iMac blow away a high-performance 400-MHz Pentium II running a Macromedia Director file. It would have been better to do a comprehensive speed comparison, instead of just using three or four programs and then declaring a winner.

Mitchell Parks, Internet

THE iMAC IS a consumer product. Speed is not the only important factor; the iMac kills PC boxes in areas like ease of use and troubleshooting. Expansion issues are moot—home users aren't adding extra hard drives or FireWire cards. The iMac is for consumers who want Internet and gaming features.

Matt Eberly
Madison, Wisconsin

YOUR COMPARISON CHART "An Extra $300 Gets You..." ignores the extras an iMac provides—a built-in 56-kbps modem, infrared port, 10/100Base-Tx ethernet, and USB support, plus real plug and play and MacOS (which is still easier to use than Windows 9*x*). Out of the box, onto the Internet. "No floppy drive," you protest? Don't tell me you still sleep with a stack of 3.5-inch install disks for Windows 3.1 under your pillow.

Benjamin J. Mishkin
Hanover, New Hampshire

APPLE IS GUILTY of hype when it quotes benchmarks selectively. And the 400-MHz Pentium II was the fastest of the three computers tested. However, for the Photoshop and Quake tests, the performance of the 233-MHz iMac with 64MB of RAM looks similar to that of the 333-MHz Celeron machine with 64MB of RAM. The big difference surfaces with Word and Excel. I once compared these programs on identically speed-rated Mac and Windows machines. For many repetitive tasks, performance was equal down to the second. But for other tasks, the Mac was much slower. My conclusion: Anyone who thinks Microsoft would let its Mac versions run as fast as its Windows products probably believes in the tooth fairy.

John Bevan, Cincinnati

Editor's response: Believe it or not, many of us at *PC World* root for Apple, since consumers would benefit from the competition a stronger Apple would provide. We took Steve Jobs at his word and compared the iMac with the fastest Wintel PC available. It didn't measure up. To be fair, we then compared it with a similarly priced Wintel machine. It didn't measure up. To be extra fair, we added RAM and recompared. The iMac improved, but still fell short. —Bill Snyder

ILLUSTRATION JOHN CUNEO

COMING UP

IN MARCH

BANDWIDTH ON DEMAND 1999

More of us are now using demanding streaming audio and video to surf the Web. We give you the best access options: from cable and DSL to satellite and ISDN.

CHOOSING YOUR ISP

Overwhelmed by your ISP choices? Don't sign up with the first provider that sends you a disk. We tell you whether to go with a national, regional, or local ISP—plus which providers are top-rate.

FAST 'N' CHEAP WEB SURFING

Are ISDN, DSL, cable, and satellite too pricey or simply unavailable? We check out cheap Web speedup alternatives like caching utilities, modem bonding software, and dual modems.

THE FUTURE OF NET ACCESS

Three years from now, the Internet's going to be a very different place to surf. You'll have fast enough access for voice and video as well as data. So how do you get there from here?

ALSO NEXT MONTH

▶**The PC World Top 100:** The Top Power Desktops, Budget Desktops, Notebooks, Home PCs, Printers, Monitors, Graphics Boards, and Modems.

▶**Low-Cost Servers:** Speedy Xeon processors promise to improve choices for new server buyers. We compare the first wave of Xeon servers to their Pentium II predecessors.

▶**Here's How:** *Internet Tips* on avoiding browser upgrade snafus, *Hardware Tips* on surviving your migration to a new PC, *Windows Tips* on rearranging menu items in Windows 98.

PC WORLD

ratings to point out differences that we think will be significant to PC buyers. When analyzing the raw data, we took into account sample size, statistical correlations, and other standard research tools to come up with ratings that are both valid and meaningful to readers. We chose not to publish all supporting raw data simply because of its sheer volume.

Your confusion about the results for the "Percent of PCs with problems" and "Problems per year" scores is due to our error. The "Problems per year" score is based on a straight number of problems per year, not a percentage, as published. For example, five stars in the Work PCs category was awarded to those companies whose PCs had less than one problem per year on average, as reported by survey respondents.

KEYBOARD CLEANING: STAY ON THE WAGON

DAVID CHARLAP [*Letters*, December] is incorrect in saying that computer keyboards should be cleaned with alcohol rather than with water. After 30 years of maintaining electronic equipment, I can tell you that if you spill coffee or soda on your keyboard, warm water is the only thing to use. If you clean it with alcohol, you'll be left with a sticky, gummy mess. If your keyboard contains ferrous metals, you should scrap it and get a good one. The bottom line: Don't be afraid to use water to clean your keyboard. Just be sure to let it dry thoroughly before putting it back into service.

Michael A. Bushilla
Fairfield, California

FOR STEVE@CRANKY.COM

STEPHEN MANES'S *Full Disclosure* column ["Can This Machine Be Stopped?"] in the December issue is full of misdirections and half-truths. Windows 98 is easy to shut down. So is Windows 95. You just need to have installed the operating system on competent hardware with good drivers and application software. The first time you use a bum driver for a device, or a 16-bit driver, or the first time you load your machine with a buggy application that refuses to acknowledge shutdown requests and the like, you create problems on your system that are *not* the fault of Windows. Blame the poorly skilled application programmer who wrote that nifty genealogy program you like so much, or the game from a company known for producing buggy, incomplete products, but don't blame the operating system.

John Hamilton, Internet

I COULDN'T agree more with Stephen Manes. In no other facet of our lives would we live with this lack of "getting it right." And his parting paragraph—that as long as a certain monopoly runs our computers, we can't expect things to get better—hits the nail on the head.

Bruce A. Birr
Rhinelander, Wisconsin

PC World *welcomes your responses, ideas, and other letters to the editor.* *See page 14 for contact information.* ■

CORRECTIONS AND CLARIFICATIONS

IN JANUARY'S "V.90 Modems: The End of the Line," the Best Buy box should have noted that the Zoom Fax/Modem 56K-PCI lacks simultaneous voice-data phone line sharing.

The January *Top of the News* story about Internet Explorer 5 ("IE 5: Looks the Same, Works Better") made an error comparing Netscape's Navigator 4.5 and IE 5; it should have stated that Netscape Navigator 4.5's productivity tools are no match for IE 5's.

A chart In December's "Seven Smartest PC Upgrades for Under $200" listed the wrong capacity for CD-RW discs; their capacity is 650MB.

The same article gave an incorrect price for the Acer Extensa 367D. Currently, its list price is $1299.

In December's *Top of the News* story on sub-$500 PCs, the phone number for PrecisionTec should have been 888/722-8284.

In November's "One Desktop, Two Browsers, 72 Tips," the URL for The Limit Software should have been www.thelimitsoft.com. According to the site, however, Password Memorizer, the shareware product mentioned in the article, is no longer available.

In the same article, the URL for the MTU-Speed utility omitted a hyphen. The correct URL is www.mjs.u-net.com/mike.htm.

PC World regrets the errors.

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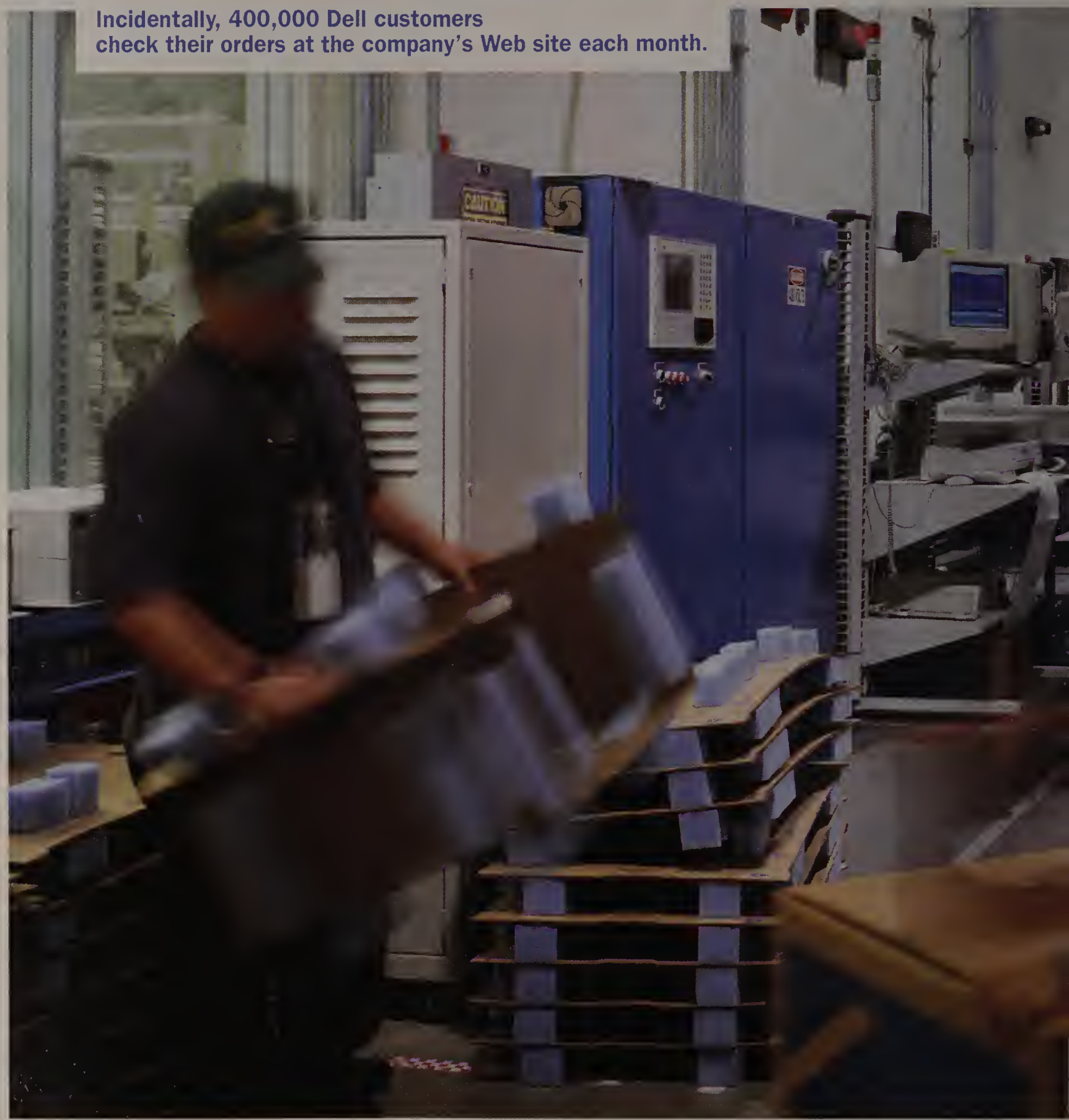

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Will a Y2K Bug Blow Up in Your Face?

Finding out whether your system can repel the millennium bug may be harder than you think.

ILLUSTRATION DAVE PLUNKERT

AS THE CLOCK TICKED ever closer to 2000, Jim Reid, a document control supervisor from Florida, had a simple question: Would his two-year-old NEC Ready computer fall victim to the millennium bug? First he checked NEC's Web site but found no mention of his specific PC. Then he sent an e-mail to the company's technical support department and received a terse and rather distressing response: "We do not have a BIOS that will make your computer Y2K compliant. We regret any inconvenience this may cause."

That's when Reid panicked. "Do I throw my machine in the garbage on January 1?" he asked. As it turns out, his situation is less dire than NEC's first message implied. His model PC hasn't been tested for Y2K compliance, so NEC has yet to decide on a fix. (The technician who answered his first query evidently wasn't aware of this.) In the worst case, he'll have to manually reset the computer's internal date on January 1, 2000. He won't, as he once worried, have to toss out his $3000 PC.

Reid's uncertainty about his computer illustrates the Y2K problem's potential to strike fear in the hearts of computer users everywhere. With all the press surrounding the issue and the countless gloom-and-doom predictions of an end to life—computing and otherwise—as we know it, tensions are running high.

Some panic is inevitable, given the scope of the problem. But solid information, plus a commitment by vendors to help customers through the maze of compatibility issues, can go a long way toward stabilizing this volatile issue.

INFORMATION WANTED

NOT SURPRISINGLY, consumers want to get their computing houses in order. Though the "easy solution"—as one industry executive told me—is to buy a new PC and upgrade your software, that fix is not a practical or affordable answer for most of us. The next-best alternative is to figure out whether each product you use is Y2K compliant. (For tips on how to do this, see last month's "2000: The Year of Living Dangerously," www.pcworld.com/jan99/y2ktips.) This is where hardware and software companies come in. Sure, you can buy a software tool to test your system's exposure to the millennium bug. But shouldn't you be able to get that data from the companies whose products you're using?

Many companies supply updates about their products' Y2K-compliance status on their Web sites. Most major PC companies explain the problem clearly and provide an exhaustive listing of their systems, stating whether each model is compliant and identifying the available fixes. Dell, Compaq, and Packard Bell have especially informative and easy-to-follow online resources. On the software side, Microsoft, Lotus, and Corel offer similar product information. But many other companies haven't addressed Y2K compliance publicly, heightening customers' concerns (some call it hysteria).

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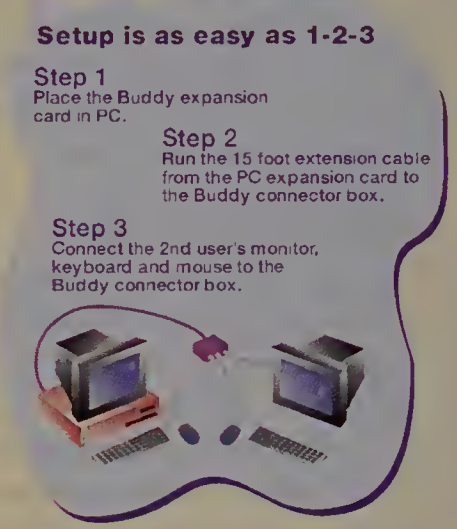

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Disclosure Act last fall. Under the new law, any businesses that post Y2K-related information between July 14, 1998, and July 14, 2001, that later proves to be inaccurate cannot be held liable for their error, provided that the misinformation was unintentional.

Such protection seems reasonable. But critics of the new law are justifiably worried that companies will hide behind some vague statement about year 2000 compliance in the event that consumers sue for having received inaccurate or misleading information. (Of the hardware and software company Web sites I visited, Corel's was the only one that specifically cited the new law.)

> Perhaps the knottiest question of all is the one with the price tag attached: Who should pay for these upgrades?

SHOULD VENDORS OFFER FIXES?

SHARING COMPLIANCE information with consumers is a crucial first step. But it's not enough for a company to say that a product will not function properly in 2000. The vendor must also tell customers what it plans to do about the problem. Will it offer an upgrade? Are there work-arounds for products that won't be made Y2K compliant? At a minimum, a company that doesn't have a fix should inform customers about the status of its investigation. Consumers need this information to make decisions about when and how to prepare themselves for D Day.

Here's where several companies have run into problems. At this writing, nearly a dozen lawsuits have been filed against hardware and software companies, including Intuit, Micron, Quarterdeck, and Quarterdeck's new parent company, Symantec. The facts in each case differ, but the issues they raise can be boiled down to three questions: Should a software developer or PC maker be obligated to tell its customers if its products are not Y2K compliant? If so, should the company be forced to fix any millennium bugs before the ball drops? And perhaps the knottiest of all, who should pay for these upgrades?

Many companies are scrambling to test products for Y2K compatibility. Others have yet to decide what type of fix—if any—to make available. One of the best ways to keep up with the latest developments is to visit www.year2000.com, which supplies links to year 2000 information on dozens of company Web sites.

NO FREE UPGRADE?

SOME INDUSTRY leaders believe consumers should pay to upgrade their systems and software. But hardware and software companies shouldn't use the millennium bug to force a global upgrade on consumers. From where I sit—at an early-model Pentium running software that's two generations old but works just fine, thank you—paying for an upgrade is an unreasonable solution. Why should consumers have to buy new products because of flaws that the manufacturer may well have known about when it released the product?

Corporate responsibility, however, only goes so far. Anyone still using DOS applications—or even Windows 3.1 products—can't realistically expect to be bailed out. Hardware and software companies are too busy fixing newer releases to correct problems in versions of operating systems no one sells any more. But how far back should they go? One year? Two years? Five? The courts haven't spoken yet, but don't hold your breath waiting for companies to fix old software.

Ultimately, companies must share information and, when reasonable, provide their customers with practical fixes. Should those fixes be free? Yes, if possible—particularly in the case of products released after companies had become aware of the Y2K time bomb. At the very least, consumers should be able to get guidance on when and how to correct their system and software.

Anything less is bad business.

Contributing Editor Roberta Furger is author of Does Jane Compute? Preserving Our Daughters' Place in the Cyber Revolution *(Warner Books, 1998). See page 14 for contact information.* ■

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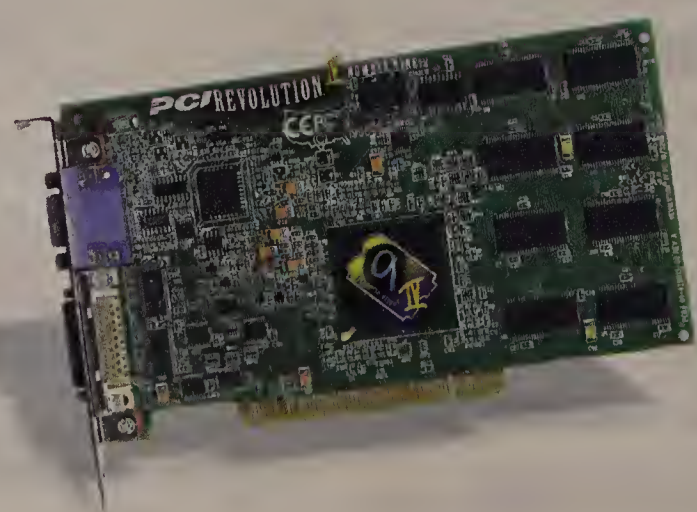

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Extended Warranties: Worth the Cost?

SHOULD YOU BUY an extended warranty for your PC? James Dodez of Middletown, Rhode Island, doesn't think so. Dodez got a brochure for a General Electric extended warranty when he got his CyberMax PC, but he wasn't happy with the service he bought. He laments, "GE promises fast, convenient computer service, but dealing with GE isn't convenient and their idea of fast is measured in months." Chip Keeling of GE responds that if a technician comes on-site but can't fix the PC, average repair time is five days. He also says the technician will attempt some troubleshooting on-site.

While warranty terms vary, an extension often buys less than you might expect. At Quantex, for example, extended-warranty techs work for Philips Magnavox. Under the standard three-year warranty, a Quantex tech will troubleshoot problems on the phone and suggest replacement parts. With the extension, a Philips tech will install the part on-site; if the fix doesn't work, you're back to the phones.

Dell, on the other hand, provides its own extended service and trains its on-site techs. There's no third party involved.

In any case, an extension shouldn't be your first choice when buying a new PC. Instead, buy a system with a three-year original warranty (a common option) that includes one year of on-site service. After that year, if you're scared to do your own repairs—and if you plan to keep the computer for another few years—buy yourself additional on-site service with an extended warranty.

If you purchase your PC with a credit card, check to see if the issuing bank will double the manufacturer's guarantee for no charge.

Regardless of your choice, however, consider whether your money would be best spent on a system that has better expected reliability (see our November 1998 report, "PC Reliability and Service: Who Can You Trust?" www.pcworld.com/nov98/service).

ICONS: JEFFREY PELO; ILLUSTRATION: ROBERT NEUBECKER

Heads Up...

ONE READER LUCKY enough to have **@Home's** cable modem service was told during his first tech support call that he'd have to pay $35 for his next. True, says an @Home rep, but the first call is free and the next costs only if the caller caused a problem that requires support to reinstall service... I got a couple of letters alleging false advertising by PC maker **Unicent Technologies**. The company's Web site (www.unicent.com) claimed tech support hours of 8 a.m. to 10 p.m. EST, but support is actually open only until 8 p.m. A Unicent spokesperson explains that hours changed on October 1. The Web site is now fixed... According to the U.S. Bankruptcy Court, **JTS Corporation**, a hard drive maker in San Jose, California, has filed for involuntary Chapter 7. Unfortunately, I was unable to locate a trustee for the case. Stay tuned for further details... **Storm Technology**, makers of popular scanners, recently filed voluntary Chapter 7. Jerome Robertson, bankruptcy trustee, says that "the likelihood [that another firm will honor Storm's rebate or provide warranty repair service] is zero." Though customers can file claims at the bankruptcy court in San Jose, Robertson states that due to ongoing litigation it may be two to three years before claimants see any results—if they ever do.

LETTER OF THE MONTH

I'D APPRECIATE ANY help you can give me in my effort to get Toshiba to live up to its warranty obligation. My problems started in June 1998 with the disk drive in my Toshiba laptop and desk station. Since then, I've hauled it to a Toshiba repair center and shipped it twice to a repair facility with no luck. I've asked Toshiba for a replacement, but haven't gotten it.

—David F. Brown
Bellingham, Washington

PC World responds: I contacted Toshiba on Brown's behalf and asked the company to replace the part or the notebook, as the warranty recommends. A spokesperson told me Toshiba would indeed replace Brown's laptop. In fact, the company went one step further and replaced it with an upgraded model. A Tecra 730 was sent to replace Brown's Tecra 720; unfortunately, the new unit Brown received had a broken CD-ROM drive, which Toshiba says it will fix. ■

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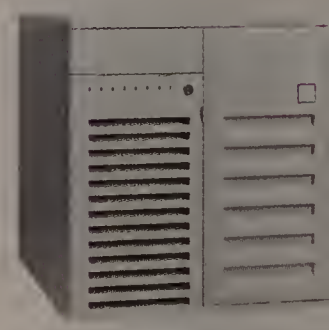

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Home Networking Without the Network

PROBLEM *You want to share files between two PCs without the expense and hassle of a full-blown LAN.*

SOLUTION *Make a simple, efficient connection by using low-cost cables and a Windows utility.*

PHOTOGRAPH: DONNA BISE

THE NUMBERS SPEAK FOR THEMSELVES: More than 15 million households have at least two computers, not counting the millions of company laptops used at home for after-hours work. So it's no surprise that companies such as Diamond Multimedia, NetGear, and Intelogis are introducing networking kits aimed at home users. But these kits aren't cheap—a two-PC setup can cost $200 to $300—and they're overkill for people with modest needs.

Take Dale Johnson, for example. Johnson, who videotapes weddings and other social events for a living, uses two Compaq Presario desktops for his home-based business. He wanted to link the two PCs so he could store mirror images of vital data on both hard drives.

"I didn't look very hard at a network because I didn't know much about it, and I knew it meant adding another card to my machine," says Johnson. He found an alternative in Direct Cable Connect, an applet included in Windows 95 and 98. DCC lets a PC access another system's disk drive over a serial or parallel cable, creating a dirt-cheap (albeit slow) mini-network.

MAKE THE CONNECTION

THE ONLY HARDWARE you need to support DCC is a $10 serial or $30 parallel file-transfer cable to connect two systems. After establishing the link, you can use the PC you're working at to access the other system's drives through Windows Explorer or within apps. Besides its usefulness for quick-and-dirty networking, this capability is a lifesaver for installing software onto a laptop that lacks a CD-ROM drive—just connect the notebook to a PC that has such a drive.

Once set up, DCC is simple to use, but configuring it requires several steps. In many cases, you'll need to install DCC from the Windows 95 or 98 setup disc. Put the Windows CD-ROM into the CD-ROM drive, and click *Start•Settings•Control Panel*. Double-click the *Add/Remove Programs* icon, and click the *Windows Setup* tab in the dialog box. In the scrolling list, click the *Communications* item and then click the *Details* button. Click the check box next to *Direct Cable Connect* to select this option. Click *OK* to start the installation. Repeat this procedure for each PC you wish to connect.

To make data available to other PCs, you must tell Windows to share drives with other machines. The PC whose drives you want to share is the *host*; the one accessing them is the *guest*. On the host PC, right-click the *Network Neighborhood* icon on the Desktop and select *Properties*. On the Configuration sheet, click *File and Print Sharing*; then, in the resulting dialog box, check *I want to be able to give others access to my files*.

Now tell the host system which drives you want to make available to the guest. On the host PC, right-click each drive icon in Explorer or My Computer and click the *Sharing* menu item. In the Sharing sheet of the drive's Properties dialog box, click the *Shared As* button and enter a name for the drive in the Share Name box. Repeat this set of steps for every drive you want the guest system to access. ▶

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Next, connect the PCs. Although serial cables are cheaper, a fast parallel cable works much better for installing software or moving large files over the wire. Just make sure you use a bidirectional parallel cable—older ones may not work.

Finally, launch DCC on both PCs (from the Start menu's *Programs•Accessories•Communications* folder), and identify the host and guest machines. Once the connection is made, launch Windows Explorer on the guest PC and choose *Tools•Map Network Drive*. Use the drop-down Path list to select a drive on the host machine. Repeat the process to map other drives. From then on, just connect the PCs and launch DCC. The host's shared drives will appear as local drives on the guest PC, and they can be used with Windows Explorer and other file-management tools.

DCC won't win any awards for speed: A 2MB file can take about 30 seconds to copy over a parallel cable, while a serial transfer may take nearly three times as long. "I'll click and drag to have the program start transferring, and I'll go and do something else," says Johnson, who moves about 120MB of data across a parallel cable once a week. "The time is not that big a concern to me."

NO LAN PANACEA

DALE JOHNSON'S work-around isn't for everyone. The more often you need PC-to-PC connectivity, the more you'll benefit from the speed of a real network. If your systems have free slots, you can set up a two-PC Ethernet LAN for less than $100, though configuring it can be tricky. And unlike a full-fledged LAN, Direct Cable Connection doesn't provide a practical way to share a printer between two PCs. (Johnson manages the task of sharing one ink jet printer between his two systems by using a cable–switch box setup.)

Still, Johnson likes his setup. "It's a bit of a spider web to have all those cables set up," he says. "But it's very functional and easy to use. You don't have to crawl under the table to switch the cable around."

Michael Desmond is a Vermont-based contributing editor for PC World. *See page 14 for contact information.* ■

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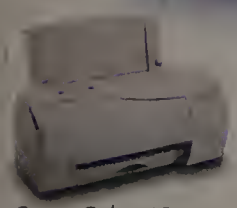
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I Declare War on Telemarketers

"HI, THIS IS Stan. How are you today?" Oh, jeez, another intrusive telemarketer calling, shattering a brilliant thought. (Now where was I?)

"I'm terrific," I responded. "Can you hold a sec?" With a home phone and two business lines, I'm inundated with these calls. But this time, instead of following my usual modus operandi—saying something obscene in COBOL and hanging up—I turned to my PC and loaded Enigma. This slick program helps me thwart telemarketers and keep them from calling back. Best of all, it's free.

"What's the name of the company you're calling for?" I asked, reading from the monitor (and ignoring the mangled prose).

"San Gabriel Register," he said cheerfully. (Yep, I made up that name to protect the obnoxious telemarketer and keep me out of court.)

"Cool," I said supportively. "Could you please tell me your full name, Stan?"

Pause.

"Don't be shy," I prompted, a grin on my face. This was going to be fun.

"Did you know," I added, "the Federal Trade Commission says that a person or entity making a telephone solicitation must provide the full name..."

"Stan Schmendrick," he interrupted.

"Thanks, Stan," I said. "You realize that telemarketers have to keep and maintain a 'Do not call' list? And they can't call again for ten years?"

I stifled a giggle. See, just hanging up on the guy would get me nowhere. But with Enigma on my PC, I felt like the Telemarketer Terminator. The program prompts me with eight precise questions based on the Telephone Consumer Protection Act, along with the text of the law. I ask each question, wait for the telemarketer to squirm, fill in the response, and keep a log. Simple. And I swear, it works.

> Just **hanging up** gets me nowhere. But with **Enigma** on my **PC**, I feel **like the Telemarketer** Terminator.

"Can you wait a minute?" asked Stan, sounding like he'd swallowed his toothpick. I heard his headset hit the desk.

It gets better. If the company calls again within 12 months, you can sue for up to $500 per violation. Nice.They must have a "don't call" written policy (no? the fine could be a whopping $10,000), and then the FTC may hit them for another somewhat paltry $500 if they don't send you a copy. Fun, huh?

The entire regulation is on the FTC site, www.ftc.gov/telemarketing. Better, visit the exhaustive Karen's Koncepts Anti-Telemarketer & Anti-Spam Page at www.netmegs.com/koncepts/telemark.htm. You can grab a copy of Enigma at www.verinet.com/~geoff/Enigma or from PC World Online at www.fileworld.com.

Stan's supervisor came on the line. She took my number and promised not to call again (for ten years, pal).

THIS CALL'S FOR YOU

I HAD SUCH a good time tormenting Stan that I decided to get Caller ID and screen all my calls. (Don't worry, Mom, your tech support calls will still get through.)

Instead of buying a cheapie Caller ID gizmo, I splurged on Nortel's Meridian 9617, a two-line phone that connects directly to my PC's underused USB port. At $330, the Meridian isn't cheap, but its features make the price tag easier to swallow.

With Caller ID, the Meridian pops information about each incoming call onto my PC screen. Most local telemarketers don't block Caller ID, so once I have their numbers, I tell the phone to reject their calls. I've also set the Meridian to play different .wav files on my PC based on the caller's ID, so I can tell when my editor's calling by the sound—for example, the braying of a mule.

I can seamlessly conference two callers using the Nortel PC software or tell the phone to page me when I'm out of the office. Easily the coolest function is Meridian's Voice Dialer. It lets me place a call by saying the person's name; using voice recognition software, the machine identifies the person and then dials the number. Best of all, the Meridian works even if my PC's powered down.

Hey, I've got to go, the phone's ringing. I hope it's Stan—I could use the money.

Find files in this article at PC World Online (www.fileworld.com). Contributing Editor Steve Bass is a licensed marriage and family therapist and president of the Pasadena IBM Users Group. *See page 14 for contact information.* ■

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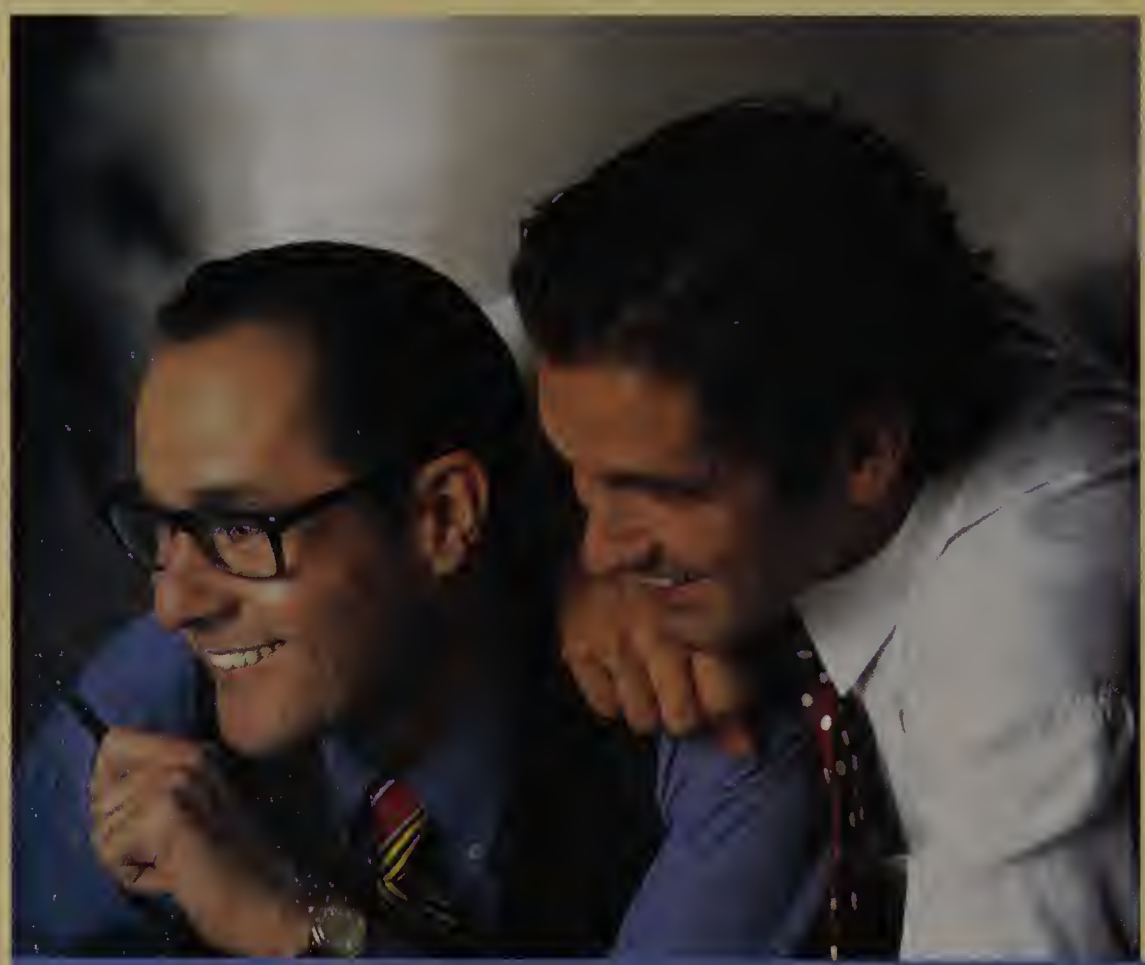

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McAfee's mess ◆ Umax driver may damage disks ◆ More IE 4 security holes

McAfee Utilities Just Don't Get Along

MCAFEE SOFTWARE'S McAfee Office suite is a tempting buy. For $100 you get a grab bag of ten separate, free-standing utilities—including VirusScan, Nuts & Bolts 98, and Guard Dog—that would cost hundreds of dollars if purchased separately. McAfee Software's parent company, Network Associates, acquired almost all these products when it recently bought up competitors CyberMedia, Helix Software, and PGP (Pretty Good Privacy), and the company's unfamiliarity with its stepchildren shows. *Bugs and Fixes* readers report problems just getting the suite installed.

McAfee Software recommends installing one product at a time. But even then, a conflict can bite you. Guard Dog's File Guardian feature may lock up your system when you try to use Nuts & Bolts 98's DiskMinder, DiskTune, or Image tools. At press time, the 20KB fix for the Guard Dog lockup was tucked away in the company's Web-based discussion forums at support.nai.com/Forums/Attachment.cfm/GDFSHK.VXD?CFApp=23&Attachment_ID=71. McAfee Software suggests that you download the file and then copy it into your Guard Dog folder. (If you use use Oil Change, it will put the file in the folder automatically.) When I downloaded the fix using Internet Explorer, however, the resulting file lost its .vxd extension—and the patch won't work without it. You may have to rename the file and add the missing file name extension back on. By the time you read this, you may also be able to obtain the update by using the Oil Change utility that comes with McAfee Office.

Another headache with Nuts & Bolts 98: The Registry Wizard's Tune Up option has various problems that can corrupt Windows 98's Registry in some situations. McAfee Software posted an Instant Update fix last November but withdrew it when the new code caused the same problem elsewhere in the Registry. As we went to press, the company said it planned to release a corrected fix shortly. To download and install Nuts & Bolts 98 Instant Updates, choose *Start•Programs•Nuts&Bolts 98•Instant Updates.*

Umax Scanner Driver: Death to Disks

BUGS AND FIXES reader Steven Paglierani is more than just miffed at scanner maker Umax. While building himself a new cutting-edge system, Paglierani kept encountering file-corruption errors that prevented him from running—or even installing—Windows on his new system. After months of troubleshooting and replacing memory, hard disks, and hard disk cables, he stumbled across a Microsoft Knowledgebase article (support.microsoft.com/support/kb/articles/q191/8/74.asp) that explained everything: One of Umax's scanner drivers randomly corrupts the hard disk's file allocation table. The problem occurs only with 300-MHz or faster Pentium II CPUs. Umax has posted a patch for the problem on its Web site. Point your browser to www.umax.com/graphsite/umaxen/support/download/scanners.cfm and refer to TechNote 7076. (You have to register first at support.microsoft.com to view the knowledge base.)

THE SIEGE OF INTERNET EXPLORER 4

WHEN WE LAST left our browser insecurity drama (in last month's column), Microsoft had just patched Internet Explorer 4.01 to close a nasty security hole named after researcher Juan Carlos Garcia Cuartango. This flaw allowed Web page scripts to copy files from a user's hard disk to a remote system. Cuartango subsequently found another way to exploit the same flaw—a feat now renowned everywhere (except at Microsoft) as "Son of Cuartango." The problem affects IE 4.01 and 4.01 with Service Pack 1 under Windows 95, 98, and NT 4.0. See Microsoft's explanation of the security flaw, along with a link to the new and improved patch, at www.microsoft.com/security/bulletins/ms98-015.asp.

You can find files mentioned in this article at PC World Online (www.fileworld.com/magazine). Scott Spanbauer is a contributing editor for PC World. ■

IN BRIEF

Is QuickTime Flakiness Apple's Fault?

IN THE COURSE of the U.S. government's antitrust case against Microsoft, Apple Senior Vice President Avadis Tevanian testified that Microsoft specifically sabotaged Apple's QuickTime software, preventing it from playing certain types of multimedia files embedded in Web pages. Not so, says Microsoft. It hired independent software testing labs Mindcraft and Sax Software to get to the bottom of the conflicts with Internet Explorer. Both confirm that the problem lies with errors in Apple's own QuickTime installation program. Mindcraft's online white paper (www.mindcraft.com/qtfix) explains it all and offers several different patches that vanquish the problem. As we went to press, Apple's QuickTime Web site had not yet supplied any update for dealing with the glitch.

BUGGED?

FOUND A HARDWARE or software bug? Tell us about it via e-mail at bugs@pcworld.com.

ICON: JEFFREY PELO

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TOP OF THE NEWS

On Target!

$1499 PCs Hit the Mark

No compromise. Who says a great PC has to cost $2000? Fast, full-featured systems based on Intel's new **Celeron-366** and **AMD's K6-2-400** could make you forget the Pentium II. ◆ **By Laurianne McLaughlin**

CyberMax Enthusiast KII 400

PHOTOGRAPHS: MARC SIMON; ICONS: JEFFREY PELO

HP Vectra VE Series 8

IF YOU CONSIDER $999 desktop PCs too light on features and $2000 PCs too heavy on price, you'll like the new alternatives. Machines based on economical chips from Intel and AMD provide an excellent balance of speed and features, at a price that's right on the mark—about $1499 including a monitor.

FAST AND CHEAP

THE BEST CELERON-366 and K6-2-400 systems we tested for this review zipped through business productivity programs, in some cases running applications like Word and Excel faster than a Pentium II-350 system. Do you work (or play) with demanding graphics applications and games from time to time? No problem. Several of the new systems are strong graphics performers. (Note that graphics performance depends heavily on a system's graphics chip.)

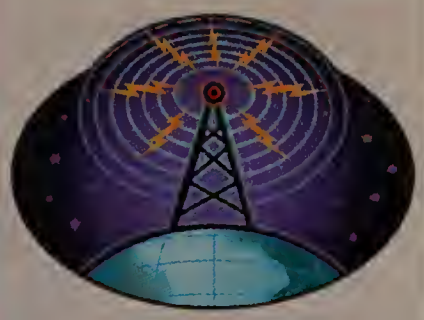
Not only are these budget-friendly PCs great performers, they're feature rich. All five systems we tested came with 64MB of RAM, and only one had a hard drive smaller than 10GB. The most impressively loaded, CyberMax's Enthusiast KII 400, includes a DVD-ROM drive, a graphics card with 16MB of SDRAM, and a 19-inch monitor—all for an eye-popping $1499 (see "CyberMax's Feature-Packed Enthusiast: Best of a Good Lot").

BUDGET GETS BRAWNY

HOW DID BUDGET PCs turn into such racehorses? For one thing, Intel's rivals, especially AMD, are keeping the CPU business as competitive as ever. Meanwhile, Intel has been trying to build a strong reputation for its budget-oriented Celeron chips.

Moreover, Intel has learned that making Celeron chips *too* much slower than Pentium IIs is risky business: Reviewers panned the first Celeron, the cacheless 266, because it performed poorly. The Celeron-333, which tacked 128KB of secondary cache onto the chip, ran much faster. Now, Intel is trying to further improve Celeron's image by rapidly cranking up the line's speed. By the time you read this, some vendors will be shipping computers based on the 400-MHz Celeron, a product Intel had originally planned to ship much later in the year. (The chip was not avail- ▶

JUST IN



Free Software Suites

STAROFFICE 5.0 Personal Edition, the modest but capable office suite from Star Division, is available free to consumers via the Web at www.stardivision.com. (The offer doesn't apply to corporate users.) The suite can't match powerhouses like Microsoft Office feature for feature, but it's comparable to lesser products like Microsoft Works or Claris Works. It runs under Windows 95, 98, and NT; OS/2; Linux; and Solaris. The Windows version is a 62MB download. Likewise, Corel plans to offer its WordPerfect Suite 8 for Linux as a free download beginning on January 17. The company is also considering whether to offer some of its Windows products as free downloads.

Visioneer Still Alive

VISIONEER, known for its PaperPort scanners and scanner software, is reorganizing, but its popular products will still be sold and supported. Taiwan-based Primax, which makes Visioneer's scanners, will take the company's name and hardware business. Visioneer bought Xerox's ScanSoft subsidiary and will sell and support ScanSoft's Pagis document management and optical character recognition products as well as PaperPort software, under the ScanSoft name.

GET UP-TO-THE-MINUTE NEWS, including hot game demos, the latest reviews, and productivity shareware, at PC World Online. Point your browser to www.pcworld.com/pcwtoday.

Rise Technology's MP6: Newest Chip on the Block

TALK ABOUT LOOKING your competition in the eye: Rise Technology, the newest CPU maker, has set up shop in Santa Clara, California, right across the street from Intel. This new company is jumping into a tough game—building low-cost CPUs for budget desktops and notebooks and selling them at prices below Intel's. The first Rise CPU, the MP6, will appear in desktops by the end of the first quarter, the company says. For this article, Rise gave *PC World* an early peek at a reference system powered by the MP6.

Rise MP6 chip

Rise faces four established players: AMD, Centaur, Cyrix, and Intel. AMD has made progress recently, thanks to a generation of chips for desktop PCs that run as fast as 400 MHz.

LOW-END COMPETITION

CYRIX AND CENTAUR currently compete with Intel's low-end chips. That's where Rise hopes to fit in—by beating Cyrix's and Centaur's chips on performance. Rise says it has paid particular design attention to how quickly the MP6 chip executes MMX instructions and how smoothly it handles soft DVD video playback. Those results remain to be seen; the MP6-powered PC we tested wasn't ready for a full round of graphics testing.

The MP6 chip will debut in two flavors: One will have a 266-MHz performance rating and will be designed for a 100-MHz system bus; the other will have a 233-MHz performance rating and will be designed for a 95-MHz system bus. (A performance rating, also

able for testing at press time.) As a result of these changes, the once-lowly Celeron now packs enough punch to please even a power user.

CELERON VS. PII

FIRST CONSIDER the Celeron's performance. Two of the three shipping Celeron-366 machines we tested, the Hewlett-Packard Vectra VE Series 8 and the Micron Millennia C366, recorded PC WorldBench 98 scores of 188 and 186, respectively, on business apps (see the test report below). In comparison, the Pentium II-350 machines with 64MB of RAM that we've tested earned scores between 178 and 188—almost identical to, if not a bit slower than, the numbers posted by Celeron-366 computers. And the average PII-400 machine snagged a score of 198, only about 5 percent faster than the HP Celeron-366 machine. It's unlikely you'll notice that small a difference in apps like Word or Excel. The fastest PII-400 system with 64MB of RAM we've tested scored 203, an unexciting 8 percent faster than the HP system.

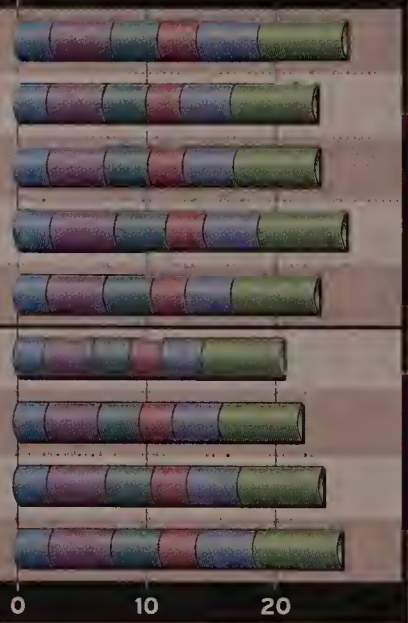
Now compare the prices: While the new budget PCs we reviewed range from $1399 to $1568, you'd have to pay at least $1599 for many Pentium II-350–based PCs and at least $1699 for many PII-400 systems. (Some high-end PII-350s and PII-400s sell for closer to $2000.) You'd pay at least $2200 for most PII-450 systems, but such machines are significantly faster (an average of about 13 percent) than the best Celerons.

For some people, a Pentium II–based computer offers advantages that go beyond clock speed. PII-350, -400, and -450 PCs incorporate a 100-MHz system bus, whereas the Celeron-366 and -400 system bus runs at 66 MHz. The faster bus speeds up some tasks, particularly those that involve large graphics or database files that don't

DESKTOP PCs: BUSINESS APPS — TEST REPORT

Celeron-366 and K6-2-400 Stand Up to Pentium II

SYSTEM	CPU	RAM (MB)	Secondary cache (KB)	PC WorldBench 98 score
Compaq Prosignia Desktop Model 310	Celeron-366	64	128	170
HP Vectra VE Series 8	Celeron-366	64	128	188
Micron Millennia C366	Celeron-366	64	128	186
Compaq Presario 5240	K6-2-400	64	512	170
CyberMax Enthusiast KII 400	K6-2-400	64	512	187
Average of 14 systems	Pentium II-450	64	512	213
Average of 15 systems	Pentium II-400	64	512	198
Average of 6 systems	Pentium II-350	64	512	183
Average of 7 systems	Celeron-333	64	128	173



Word 97 · Word Pro 97 · Excel 97 · 1-2-3 97 · Paradox 8.0 · Picture Publisher 7.0

TEST PC WORLD CENTER

HOW WE TEST All systems are tested with PC WorldBench 98, *PC World*'s application-based benchmark. A higher PC WorldBench 98 score is better. For more details on our benchmark and how we run it, see PC World Online (www.pcworld.com/testing). Data based on testing conducted by the PC World Test Center. All rights reserved.

PHOTOGRAPH: MARC SIMON

known as a "PR rating," represents the performance level of the Intel chip against which the MP6 will compete—in this case, the competition is the Celeron-266.)

Like the original Celeron-266 processor (and unlike the Celeron-333 and -366) the MP6 chip lacks on-board secondary cache. This design hurts performance.

MORE SPEED AHEAD

THE MP6 266-MHZ reference machine we tested came with 64MB of system RAM and 1024-KB of secondary cache on the motherboard. It earned a PC WorldBench 98 score of 119, on par with scores turned in by Celeron-266 and AMD K6-266 systems on productivity apps.

If Rise Technology achieves its goal of delivering better graphics performance than Cyrix and Centaur, however, MP6-powered machines will be more competitive. But even then, MP6 systems would probably have to be ultra-cheap (certainly well below $999) to be worth considering. Analyst Nathan Brookwood of Insight 64, a consultancy in Saratoga, California, says we'll likely see the first chip only in systems from small, third-tier PC companies.

Rise's second planned chip, the MP6-II, looks more compelling, since it incorporates secondary cache. The first systems using this chip will ship in the second quarter of this year, Rise says. Though the company wouldn't confirm the speeds of this chip, it is expected to offer 333- and 366-MHz performance ratings. Stay tuned.

fit inside the secondary cache. So for work like intensive desktop publishing or database mining, a fast Pentium II–powered system is worth the extra cost.

Also, systems with a 100-MHz bus make it easier to upgrade the CPU later. And users with demanding graphics needs, for whom every second counts, will probably want a PII-450 machine. Outfitted with good graphics cards, PII-450 machines run applications like Macromedia Director (a multimedia authoring tool) and games like Redline Racer faster than machines powered by a Celeron-366 or K6-2-400 processor can.

SMART CONFIGS

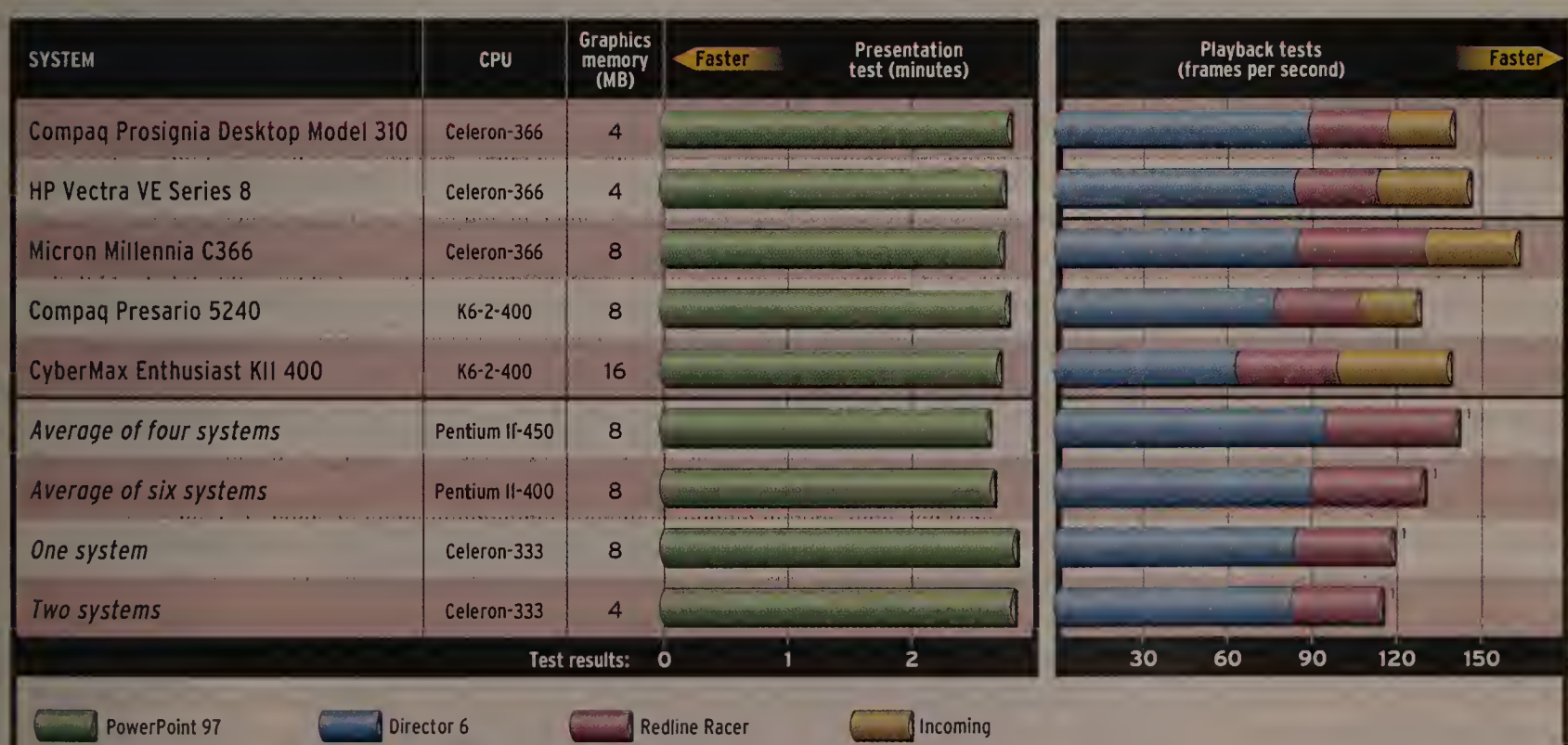
BUT FOR MANY people, the new Pentium II alternatives from Intel and AMD offer plenty of speed. You'll see the Celeron-366 in systems designed for corporations, small businesses, and homes.

At just $1434 with a 17-inch monitor, the HP Vectra VE Series 8 is a smart midrange corporate system for running Microsoft Office–type applications. Like other Vectra VEs, it has a 3Com 10/100 network card; HP's manageability software, which lets IS managers detect hardware problems early; and theft-prevention features like a lockable case. It's not suited for image-editing work, but its integrated Matrox MGA G-100 AGP graphics chip with 4MB of SGRAM works fine for apps like PowerPoint. Our only quibble: HP's 4.3GB hard drive is the smallest of the bunch.

For $1449 with a 15-inch monitor, Micron's Millennia C366 home PC delivers ▶

DESKTOP PCs: GRAPHICS APPLICATIONS — TEST REPORT

Micron and CyberMax Provide Solid Graphics for Under $1500



TEST PC WORLD CENTER **HOW WE TEST** In Microsoft PowerPoint 97, we time a script that builds a 50-slide presentation; faster times are better. Using Microsoft Active Movie, we play back a looping AVI clip while running an animation created using Macromedia director in the foreground. We also execute self-running demos in Criterion Redline Racer and Rage Incoming. For all three playback tests, higher frame rates are better. Tested applications do not make use of AMD's 3DNow technology. All systems tested with 64MB of system RAM. Celeron-366 and Celeron-333 machines tested with 128KB secondary cache; all others with 512KB. Data based on testing conducted by the PC World Test Center. All rights reserved. [1]Incoming is a new addition to *PC World*'s graphics test suite, and data is not available for some older systems.

CyberMax's Feature-Packed Enthusiast: Best of a Good Lot

CELERON-366 SYSTEM	Street price	Monitor size (inches)	Hard drive (GB)	CD/ DVD-ROM drive speed	Graphics adapter/memory (MB)	Additional features	PC World InfoNet number
Compaq Prosignia Desktop Model 310 800/345-1518 www.compaq.com	$1399	17	10	12X-40X	Diamond Viper V330/4	V.90 56-kbps modem, Compaq PS110 speakers	724
HP Vectra VE Series 8 800/755-0900 www.hp.com/desktop	$1434	17	4.3	12X-32X	integrated Matrox MGA G-100 AGP/4	3Com Fast Etherlink XL (10/100Base-T card with Wake on LAN functionality), lockable system case	725
Micron Millennia C366 888/634-8799 www.micronpc.com	$1449	15	10	24X-32X	integrated NVidia RIVA 128 ZX/8	V.90 56-kbps modem, Advent AV009 speakers	726
K6-2-400 SYSTEM							
Compaq Presario 5240 800/345-1518 www.compaq.com	$1568	15	10.2	12X-40X	ATI 3D Rage LT Pro AGP/8	V.90 56-kbps modem, LS-120 drive, integrated Compaq 10-mbps network card, JBL Pro speakers	727
CyberMax Enthusiast KII 400 888/438-2629 www.cybermaxpc.com	$1499	19	10	4.8X DVD-ROM	STB Velocity 4400/16	V.90 56-kbps modem, Aztec PCI 3D sound card, ACS 45.1 speakers, 10Base-T ethernet card	728

All systems have 64MB of system RAM. Celeron-366 systems have a 128KB secondary cache and AGP graphics. K6-2-400 systems have a 512KB secondary cache and AGP graphics.

goodies like a V.90 modem and an integrated NVidia RIVA 128 ZX graphics chip (with 8MB of SGRAM) on the motherboard. The extra memory helped this machine play 3D games more smoothly than the other two Celerons did, and to run one game, Redline Racer, faster than some PII-400s (see "Micron and CyberMax Provide Solid Graphics for Under $1500"). But remember, graphics speed often boils down to the graphics chip, not the CPU.

Compaq's Prosignia Desktop Model 310, part of a new line aimed at small businesses, costs the least of the five systems we reviewed—just $1399 with a 17-inch monitor. Like the Micron, it carries a V.90 56-kilobits-per-second modem. The Prosignia 310 also has a Diamond Viper V330 graphics card armed with 4MB of SGRAM.

K6-2-400s: BRING 'EM ON

NOW ON TO THAT healthy competition from AMD. Based on our first look, AMD's K6-2-400 systems hold their own against Celeron-366 machines and slow Pentium II-400s. Like previous K6-2 chips, the K6-2-400 includes AMD's 3DNow CPU instructions, designed to speed up applications specially enhanced for 3DNow or DirectX 6.0. Today, less than 20 applications have native support for 3DNow, and most of these are games.

> These systems are **solid,** reasonably priced, and **don't skimp on features**—a good choice for **work or home.**

Of the two K6-2-400 systems we tested—the CyberMax Enthusiast KII 400 and the Compaq Presario 5240—the CyberMax was the clear winner. This $1499 machine earned a WorldBench 98 score of 187, almost identical to the scores of the HP and Micron Celeron-366s. The two slowest PII-400 systems with 64MB of RAM we've tested earned similar scores (191 and 185), whereas the fastest PII-400 system earned a score of 203, or about 9 percent faster than the Enthusiast (a negligible difference when you're running a word processor or spreadsheet).

The Enthusiast comes with an STB Velocity 4400 graphics card laden with 16MB of SDRAM. That supply of graphics memory, the most generous here, helped the PC outperform the other four systems on two of four graphics tests: It earned the best score when running a PowerPoint presentation with an AVI file operating in the background, and when running a 3D game called Incoming. Considering that the Enthusiast also comes with a 19-inch monitor and a DVD-ROM drive, its price makes it a steal. To top it off, CyberMax earned good marks in our recent Reliability and Service survey (see "PC Reliability and Service: Who Can You Trust?" www.pcworld.com/nov98/service).

Compaq's Presario 5240 looks less impressive in comparison—$1568 gets you a 15-inch monitor and a graphics card with 8MB of SGRAM. The system was noticeably slower than the CyberMax on business apps, too, earning a WorldBench 98 score of 170.

CENTS AND SENSIBILITY

COMPUTERS BASED on the Celeron-366 and K6-2-400 chips are right on the money for many PC buyers. They are solid, reasonably priced work and home PCs that don't skimp on features. They run business productivity apps quickly. And unless you regularly tax your system's CPU with such demanding work as database mining, or you live and breathe graphics apps that cry out for every bit of speed available, these $1499-range PCs have plenty of power. (If you must have a high-end Pentium II, it pays to look ahead. See "Your PC in the New Millennium" on page 104.)

We can't make sweeping assumptions about K6-2-400 systems based on the two we tested here. But if there are more like the CyberMax Enthusiast out there, all we can say is, "Bring 'em on." Finally, you've got a great choice in between $999 lightweights and $2000 wallet busters.

Microsoft Office 2000 Offers New Apps and Web Tools

B E T A

MICROSOFT OFFICE 2000 is here—in spirit. True, the upgrade to the 800-pound gorilla of office suites won't ship until the second quarter of this year. But in the meantime, Microsoft's site is hawking a $20 beta version it calls a "Preview." Available now, nearly feature complete, and surprisingly stable, the Preview provides a solid picture of what to expect in the final version.

If you want to create content for Web sites or a corporate intranet, Office 2000 looks like a winner—it's brimming with new Internet features. But mostly, this upgrade focuses on sensible tweaks to existing tools. Few of the changes will revolutionize the way you work; others may even annoy you. And while Microsoft hasn't made the wholesale changes to file formats that it did with Office 97, I ran into some compatibility problems in my tests when running PowerPoint.

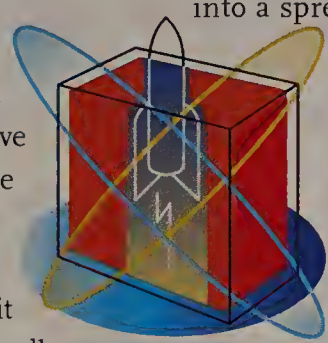
Even experienced Office users may need to spend time adjusting to alterations in the interface. Some changes are sure to be crowd-pleasers. For instance, the clipboard can finally hold more than one item. It now tracks up to 12 elements, letting you paste them selectively.

INTERFACE CAVEATS

IN CONTRAST, other "improvements" are questionable. To reduce on-screen clutter, Microsoft has redesigned the menu system so that menus show a shortened list of commands. If the command you're looking for isn't listed in a menu, you have to hover the mouse pointer over the menu for a moment, whereupon it will expand to show all the commands.

As you use features, Office promotes them to the top-level menu. After two weeks, however, I still had some trouble remembering where commands would show up. (The old-style menus remain available as an option.)

Microsoft has greatly improved Office 2000's Web features. Word, for instance, is now a considerably more advanced HTML editor: It handles frame layouts with ease and has simpler tools for embedding hyperlinks. Excel's Web Query feature, which was tricky to use in Excel 97, now lets you easily grab tabular data from a Web site, plunk it into a spreadsheet, and then tell the program to refresh it automatically with new data whenever the Web site changes. Likewise, PowerPoint has new Internet tools, including the ability to broadcast a slide show over the Web.



The upgrade could cost about $350, so spending $20 to test drive the Preview makes sense.

HTML SAVVY

CORE APPS can now open and save HTML documents as if they were native files. So, if you're creating Web pages, you can opt to work in HTML exclusively, rather than juggle multiple versions of documents. In my informal tests, Word and Excel created HTML documents that looked good in both major Web browsers. The documents also retained all their formatting when I brought them back into Office. But PowerPoint rendered pages that could be displayed only by Internet Explorer 4.0 or higher. (The app creates HTML files that can be read by IE 3.0 and Navigator, but it can't open these files itself.)

Most of Office's native file formats remain unchanged. Only Access has a new file format, and it can export databases for use in earlier versions of the app. That means you can still share most files with users of Office 97, Lotus SmartSuite, or Corel's WordPerfect Suite unless you use the new HTML formats.

Beyond the Web features, Microsoft has mostly enhanced existing features in apps as opposed to adding radically new ones. Word's on-the-fly spelling checker, already invaluable, now fixes more typos automatically: Type "editoin," for example, and Word corrects it to "edition" as you continue typing. And Excel's PivotTable data-analysis feature is both easier to use (you can lay out a PivotTable directly on a spreadsheet, rather than in a separate window) and more powerful (you can turn PivotTable data into interactive charts).

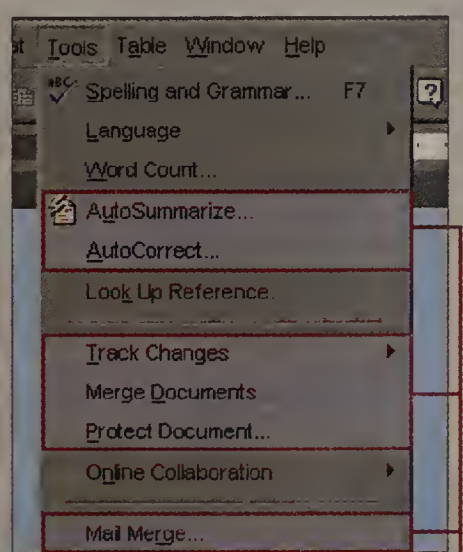
GROUP WISE?

MICROSOFT HAS also added some collaborative tools. Documents can now include threaded discussions that let coworkers comment on a work in progress. You can also embed snippets of interactive data, such as Excel PivotTables, ▶

Newer = Better?

We liked the new clipboard, but not the "improved" menus.

A SMARTER CLIPBOARD lets you cut up to 12 items for selective pasting.



WITH OFFICE's NEW MENUS, some items aren't visible unless you expand the menu.

ILLUSTRATION HANK OSUNA

Office Adds FrontPage, PhotoDraw, and Publisher

MICROSOFT OFFICE isn't one product: It's a series of packages, each encompassing multiple programs. In Office 2000, Microsoft has shuffled the lineup and added a version called Premium to the existing Standard, Small Business, Professional, and Developer editions.

The company's popular Publisher desktop-publishing program is now part of every Office version except Standard. This is great if you create graphically rich documents; the program is packed with easy-to-use wizards for designing brochures, Web pages, and so on. Serious Web and graphics types will want to invest in Office 2000 Premium, which includes the FrontPage Web site creator and PhotoDraw, a powerful business-graphics editor.

SOME BEEFS

FRONTPAGE, PhotoDraw, and Publisher are all welcome additions. But while Microsoft has tried to integrate the new members, it hasn't gone all the way. PhotoDraw's user interface looks different from that of Office's other applications. Also, both PhotoDraw and FrontPage must be installed separately. Finally, the improved clipboard, one of the suite's best new features, doesn't work in these three apps.

into a Web page, so your colleagues can manipulate the tables in their Web browsers.

These features show potential, but some will work only in organizations that standardize on Microsoft products. For example, Excel PivotTables look fine in Internet Explorer, but because they rely on ActiveX technology, Netscape Navigator users won't see them at all.

Pricing for Office 2000 was not set at press time, but Microsoft says the suite will cost about the same as the current versions. (Office 97 Professional is $349 as an upgrade and $599 for the full version.) At those prices, spending $20 to take the Preview edition for a test drive makes sense. Except for Outlook, the Preview can be installed alongside your current version of the suite, which means you don't have to give up Office 97. If that's too much bother, check back with *PC World*: Our April issue will have an in-depth, application-by-application review. —*Harry McCracken*

Office 2000 Preview
$20; Microsoft; www.microsoft.com/office/preview

Better Than Aspirin: New Tax Software Relieves Those April 15th Headaches

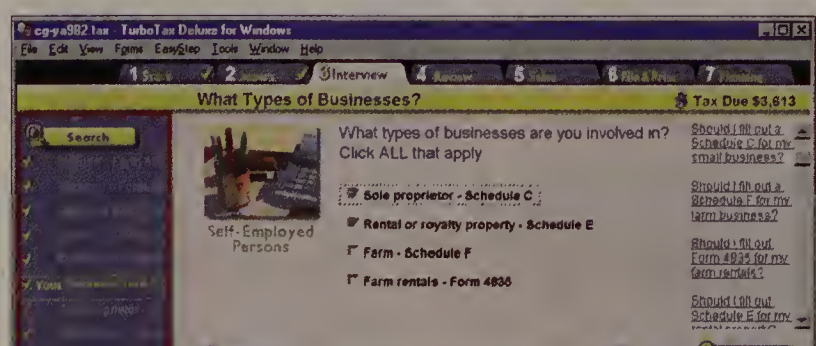
ROTH IRAS, capital gains changes, child credits—this year's tax law changes are so complicated that even the savviest do-it-yourselfers may need help. Fortunately, the two major tax preparation packages—Intuit's TurboTax and Block Financial's Kiplinger TaxCut—are better-looking and simpler to use than ever. Want to save money? A plethora of Web sites let you do your taxes for as little as $10.

Electronic filing is easier and more worthwhile than ever. E-filers can now pay electronically simply by providing their bank routing and account numbers. You can even specify when your account should be debited—as long as you hit the April 15th deadline.

If you used tax software last year, you won't even have to mail in a form with your signature. The IRS will send you a sealed postcard with a five-digit "e-file customer number" to authenticate your electronically filed return. And the IRS promises to dispatch e-filers' refunds within three weeks.

TURBOTAX FACE-LIFT

TURBOTAX, the longtime market leader, has a new look. Two-thirds of the screen retains the familiar layout of years past: interview on top, form on the bottom. But navigation is easier thanks to a new bar down the left side that lists all screens in the current section of the software and highlights those you've completed. To get to a screen, simply click on its description.



TURBOTAX'S NEW Interview Navigator bar makes it easy to access different screens in the program with a single mouse click.

Other, less obvious changes abound. Both the fast-track interviews (which have fewer explanations) and the regular interviews have been condensed into fewer screens. FAQs appear on the interview screen, so you don't have to leave the interview to get help.

The basic federal 1040 edition costs $35 (street price); the $50 Deluxe edition adds multimedia help, a library of publications, tax and IRA planners, and free online filing for one return. TurboTax also offers business- ▶

ILLUSTRATION: HANK OSUNA

Turn Talk Into Text. *Instantly!*

L&H Voice Xpress Professional™
is the ultimate continuous speech dictation software for today's business professional.

L&H Voice Xpress Professional™ turns speech into text on screen quickly and accurately – without typing. Build letters, reports, spreadsheets, presentations and virtually any other document simply by talking normally!

- NEW Advanced Natural Language Technology offers an extensive command language that lets you "Say It Your Way."
- NEW Dictate to virtually all Windows® applications creating documents as fast as you speak.
- NEW Extensive command and control to format and edit documents in Microsoft® Office, including Word 97/95, Excel 97, PowerPoint® 97, Outlook® 98, and Outlook® Express. And, it's optimized for Windows® 98.
- NEW Four FREE special plug-in vocabularies for Business & Finance, Leisure, Technology, and In The News.
- NEW "Talk and Go™" capability for certain hand-held devices – perfect for the mobile professional.
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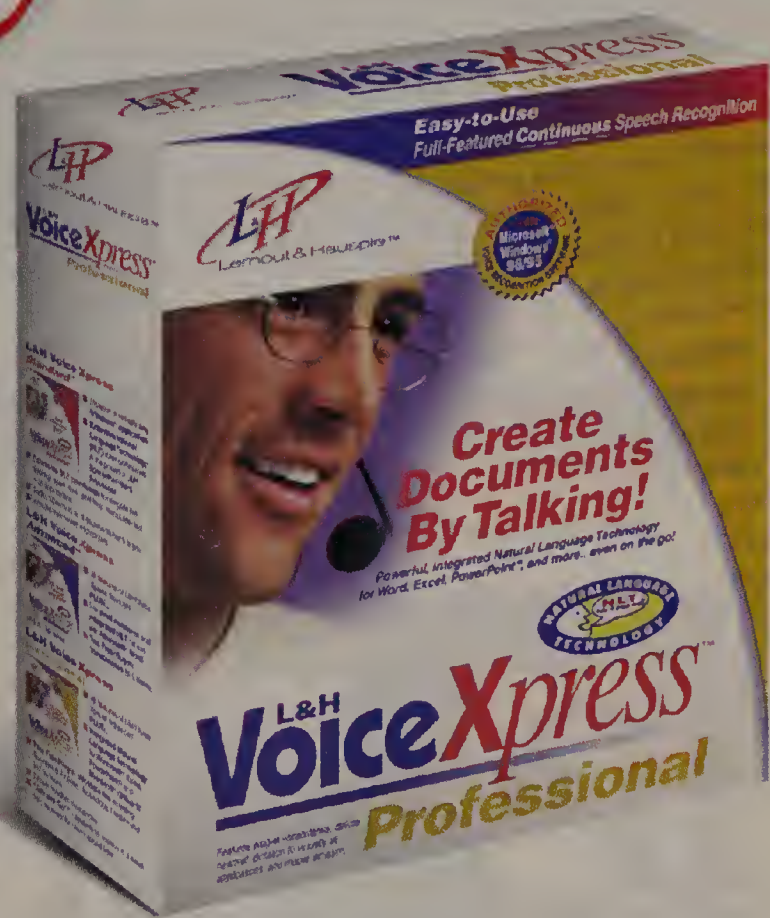

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Tips for Safe Filing

AT A TIME when many people still balk at putting their credit card numbers online, how do Web-based tax preparation services hope to convince customers to entrust their financial data to a browser? The answer: by using as many security measures as possible and telling prospective customers about each one.

Thomson Investor's Network's OneTax.com Web site, for example, lists security features on its home page. These include SSL servers, which encrypt data traveling between your PC and the firm's servers; encryption of all user-identifying data; and multiple firewalls to prevent illegal access. Even passwords are encrypted: Nobody at OneTax can access them. The safety net is a backup password for which OneTax employees can give you only a self-supplied hint. Your completed return doesn't even travel the Internet: OneTax transmits it via private phone line to the IRS.

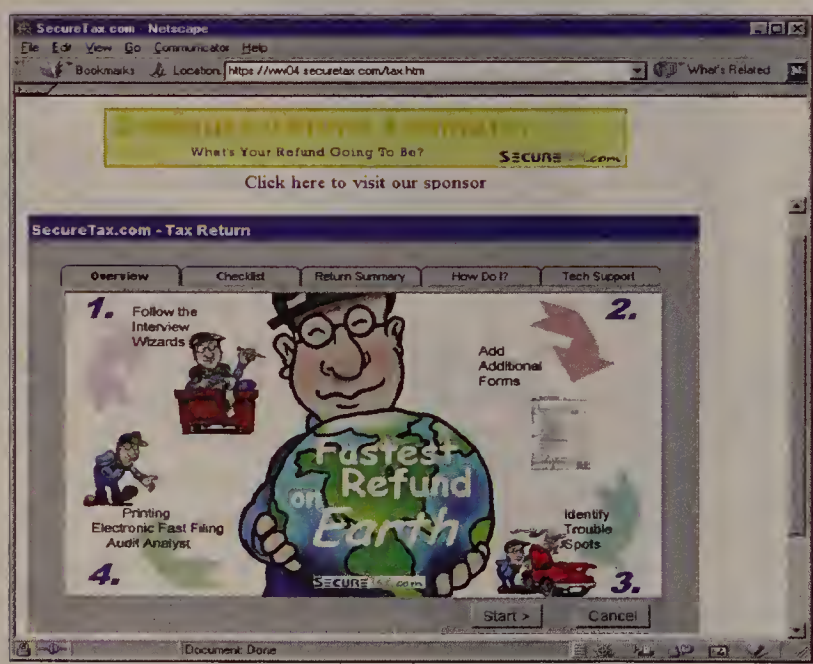
HOMEWORK TIME

INTERNATIONAL DATA Corporation analyst Chris Christiansen advises taxpayers to do some research before choosing a Web-based tax preparation service. At the very least, online filers should look for SSL servers and 40-bit encryption. Server-level data encryption and use of Diffie-Hellman or RSA encryption algorithms are also desirable. Privacy policies should include a commitment not to sell your personal data without your permission.

Web sites have the same fiduciary responsibility as a local tax preparer to keep your data confidential. "Unlike credit card information, tax information is protected by federal statute," says Ed Murphy, director of business development and marketing at Thomson Investor's Network.

How can you tell if all this security is working? Short of hiring a hacker to attempt a break-in, you have to take the Web site's word for it. "If you're using a reputable software vendor, you should be okay," Christiansen says.

oriented packages, including a $90 version that supports partnerships and corporations. The one downside is that the software on state taxes is relatively expensive—$28 for the first state and $20 for each additional one.



1040 TOON: A friendly virtual accountant offers limited help to taxpayers who prepare their returns on the SecureTax.com Web site.

In comparison, Block's Kiplinger TaxCut Deluxe is a bargain. The $40 street price includes free electronic filing and all necessary state tax software. You don't give up much, either. Like its rival, TaxCut Deluxe delivers multimedia help, a fast-track interview, improved navigation, Roth IRA assistance, and online updates. TaxCut also comes in a no-frills $20 Basic edition, but that package leaves you having to pay $25 more for the all-states CD. Block also offers a $70 business edition.

DO IT ON THE NET

MANY NEW Web-based tax preparation programs are cheap, easy to use, and a snap to find using the IRS Web site (www.irs.ustreas.gov). The three sites I previewed—Intuit's new WebTurboTax, Thomson Investor's Network's OneTax.com, and Universal Tax Systems' SecureTax.com—let you complete your return for free, charging only for printing your return in a usable form or filing it.

The most impressive—and expensive—of the three was WebTurboTax. It's a virtual twin of the retail package, but without the multimedia help and (a more significant gotcha) the ability to import data from a previous year's return. Fees run $10 for a 1040EZ and $20 for a standard 1040, and $10 or $20 for a state return, depending on complexity.

SecureTax.com's attractions include 4000 downloadable IRS forms, a 2-minute tax-refund estimator (suitable only for the simplest of returns), and a tax organizer. But you can import data from only last year's version of SecureTax. Fees are $15 for a 1040 return and up to three state returns, and $10 for a 1040EZ and state filing. OneTax.com looks handsomer than SecureTax and charges only $10, but the site warns users with even minor complexities, such as home-office deductions, to go elsewhere.

Advice on SecureTax.com and OneTax.com is limited. The beta versions I tried out had annoying glitches: Resizing windows can force you to log in again; boxes unexpectedly turn up checked; and navigation can be difficult. In general, if you need solid advice, the deluxe CD retail packages are the best way to go, with TaxCut the year's best deal.

—Yardena Arar ▶

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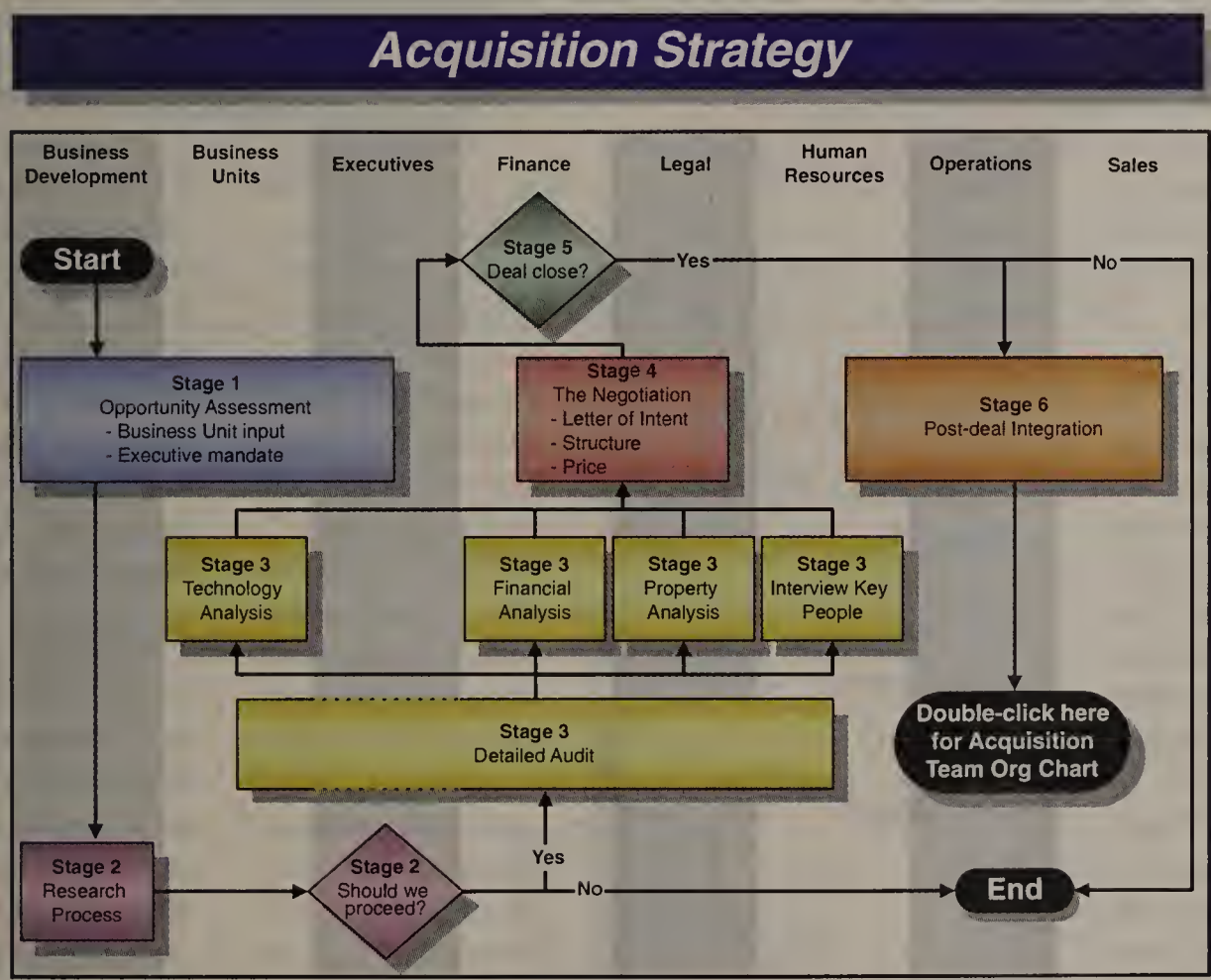

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Software Prices Still Rising: Blame It on Microsoft

ANALYSIS

NO MATTER how the "anti-trust trial of the century" turns out, one verdict is already in: Consumers have lost.

According to system vendors, industry analysts, internal Microsoft documents, and a report by an independent consumer group, Microsoft's overwhelming domination of the markets for operating systems (over 80 percent) and for productivity software (nearly 80 percent) has translated into higher prices and limited choices for consumers.

DOUBLING THE PRICE

PC VENDORS won't say how much they pay for copies of Windows, and they're understandably nervous about criticizing Microsoft. But ask them off the record, and they'll tell you that Microsoft has more than doubled what it charges computer makers for its OSes—from $15 to $25 in 1991 to between $40 and $70 in 1998, depending on the size of the vendor (see "Fewer Choices, Higher Prices").

Microsoft won't comment on its pricing policies. But the company's own internal memo entitled "PC Value Analysis," written in 1996, found that the operating system accounted for 0.5 percent of a PC's total cost to consumers in 1990, then jumped to 2.5 percent in 1996. According to Frederick Warren-Boulton, a former Reagan administration economist and a key government witness in the Microsoft case, the percentage has doubled again since then.

Microsoft's price increases have been equally tough on consumers who buy OSes off the shelf. According to the Software Publishers Association, in 1992 the standalone version of Windows 3.1 retailed for about $100; such a version of Windows 98 now sells for about $160.

KILL THE COMPETITION

"COMPANIES THAT make disk drives, monitors, and memory—those that have real competition—have cut prices, while Microsoft, which has killed off its competition, has raised prices," says Mark Cooper, consumer advocate and author of "The Consumer Case Against Microsoft." Cooper's report, written for the Consumer Federation of America (a Washington, D.C.–based consortium of state and local public interest organizations), sharply criticizes the software giant's pricing and marketing tactics. "If Microsoft was like any other technology company," Cooper says, "the price for its operating system should have come down 3 percent or in the worst case stayed flat."

Compare prices in markets where Microsoft faces strong competition with those in markets it dominates. For example, Intuit's popular Quicken Deluxe personal finance program costs about $60, a bit less than it did a couple of years ago; Microsoft's Money 99, which lags behind Quicken in market share, costs roughly the same. It's a different story in the office suite arena, where Microsoft has a 78 percent market share. According to a survey of online software stores conducted by *PC World*, Microsoft's Office 97 costs an average of 33 percent more than its rivals. At one CompUSA store, Office 97 sells for $450, while Lotus' SmartSuite and Corel's WordPerfect Suite can be had for $400 and $300, respectively.

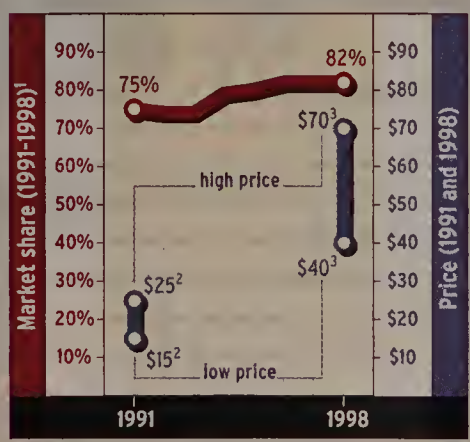
HIGHER SHARE, HIGHER PRICES?

MICROSOFT'S CRITICS say the connection between pricing and market share is proof of Microsoft's monopolistic power. According to International Data Corporation, Windows accounted for 75 percent of desktop operating systems installed worldwide in 1991; by 1998, that share had grown to 82 percent.

Microsoft acknowledges that it has pushed the boundaries on OS pricing. In a memo to CEO Bill Gates on December 16, 1997, Joachim Kempin, senior vice president of Microsoft's OEM division, warns that the company's prices for OSes could alienate such stalwart customers as Compaq. (Compaq alone pays Microsoft

Fewer Choices, Higher Prices

SINCE IT HAS achieved dominance in the market for operating systems, Microsoft has more than doubled the prices of its OSes to PC makers.



[1]Worldwide installed base of 16- and 32-bit Windows, as a percentage of overall PC operating systems. Source is International Data Corporation. [2]Figures came from the Consumer Federation of America. [3]Figures were obtained from *PC World* interviews with PC vendors.

upwards of $750 million a year for operating system licenses.) "Our high prices could get a single [hardware vendor] or a coalition to fund a competing effort," Kempin wrote. In other words, those vendors might develop their own operating systems.

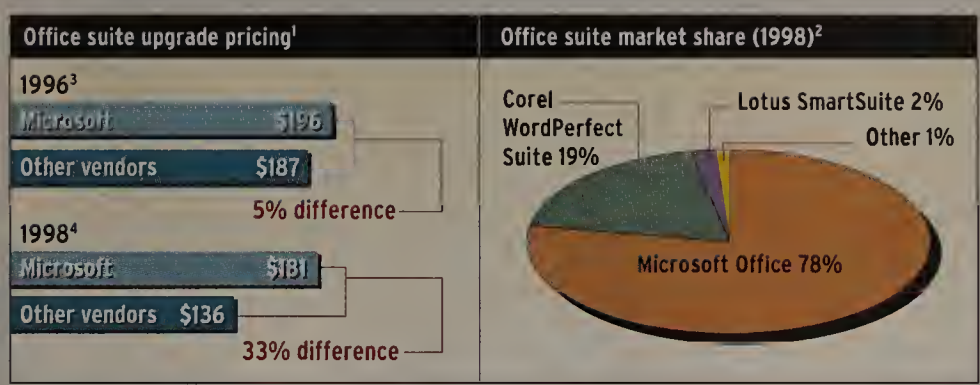
GOT COREL?

BUT KEMPIN'S concerns that incensed vendors might form a coalition and develop a competing OS never materialized. Today, no major computer vendor, with the exception of Apple, preinstalls any OS but Windows on its systems. A couple of them may give you the option of special-ordering another operating system, but they won't make it easy. Likewise, most hardware companies will preinstall only Microsoft versions of popular applications, especially office suites. Consumers buying from Micron or Gateway can't substitute Lotus SmartSuite or Corel's WordPerfect Suite for Microsoft Office; Compaq will install those other packages on your new computer, but it won't remove—and it will still charge you for—Microsoft Office.

In fact, the only times you'll find non-Microsoft products preinstalled on a PC are when you're buying from a smaller vendor. Microsoft charges one second-tier PC vendor we spoke to (on the condition of anonymity) over $150 for Office 97, while (according to PC vendors and analysts speaking confidentially) larger customers like CompUSA, Dell, and Gateway pay $100 or less. To be able to offer consumers a $1500 computer on a par with those of its larger hardware rivals, the second-tier vendor we spoke to preinstalls Lotus's SmartSuite on its systems instead of Office. (It obtains the suite from Lotus for a mere $24 a copy.)

Microsoft Office Always Costs More

FOR YEARS MICROSOFT OFFICE HAS held the lion's share of the market for office suites. Competitors like Lotus and Corel (and formerly Novell) have slashed prices; Microsoft hasn't. Why? It doesn't have to.



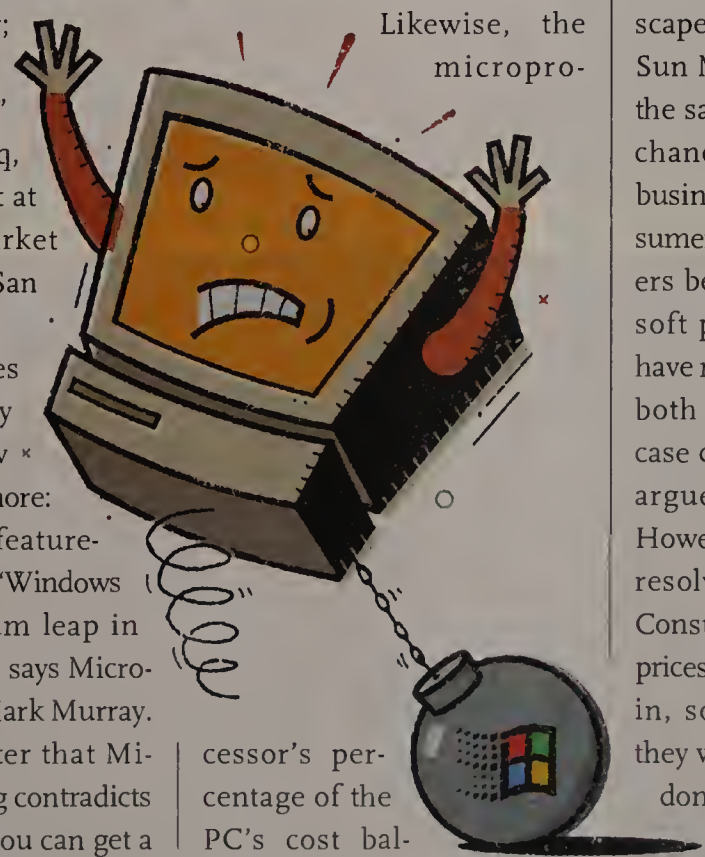
[1]Average prices for standard upgrade versions of office suites. [2]Estimated 1998 U.S. retail shipments in units. Source is PC Data. [3]Data came from mail-order ads, January 1996 *PC World*. [4]Estimated prices. Information obtained from *PC World*'s survey of online software vendors, December 1998.

DON'T BE SURPRISED

SOME INDUSTRY observers say nothing is surprising about Microsoft's pricing strategies. "Where there's competition, Microsoft prices aggressively and competitively; where there isn't, Microsoft doesn't," says Chris LeTocq, a software analyst at Dataquest, a market research firm in San Jose, California.

Microsoft argues that customers pay more for OSes now because they get more: Win 9*x* is more feature-rich than Win 3.*x*. "Windows 95 was a quantum leap in terms of features," says Microsoft spokesman Mark Murray. But critics counter that Microsoft's reasoning contradicts industry trends: You can get a 2.1GB hard drive these days for $100 or less; you couldn't buy a 20MB drive for that much in 1990. Murray says that such trends don't apply to OSes. "The cost of the plastic and the keyboard has dropped, but the cost of hiring programmers has gone up."

Furthermore, Microsoft is not the only company that has raised prices for key PC components. According to Microsoft's memo, Intel's revenue per CPU sold jumped from $108 in 1990 to $236 in 1996. Likewise, the microprocessor's percentage of the PC's cost ballooned from 3.1 percent to 11.8 percent during the same period. Which is one reason the Federal Trade Commission is investigating Intel's alleged anticompetitive behavior.



PLUMMETING PRICES

LARGE PC VENDORS defend their decision to preinstall Microsoft products, arguing that standardizing on one OS allows them to trim costs elsewhere and then pass the savings on to consumers. However, according to one analyst, if computer makers let consumers choose an office suite for their PC, the prices of suites would plunge. "For the chance to build market share, Lotus and Corel would just about give their software away," says the analyst, who wished to remain anonymous.

Microsoft has contended throughout its trial that high technology is a tough business and that rivals like Apple, America Online, Intel, Netscape Communications, and Sun Microsystems behave in the same way when given the chance. Unfortunately, the business can be tough on consumers as well. Should PC buyers be paying less for Microsoft products? Should they have more choice? Lawyers on both sides of the Microsoft case can and will continue to argue about the "shoulds." However those arguments are resolved, one thing is clear: Consumers are paying higher prices for, and have less choice in, software products than they would if Microsoft didn't dominate that market.

—*Jeffrey Rothfeder* ▶

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Fast, Vast, and Rewritable DVD-RAM Finally Arrives

FIRST LOOK

AFTER YEARS of delays, DVD-RAM is finally hitting the market. Creative Labs shipped the first upgrade kit last year; now kits from LaCie and HiVal (both based on Panasonic's LF-D101 drive) and Hitachi's OEM-only GF-1050 drive are available.

The good news is that for about $500 to $800, you can buy a DVD-RAM drive that is fast enough to copy 315MB of data in about 12 minutes. These drives are flexible, too: They read and write DVD-RAM discs (as large as 5.2-GB), and can read CD-ROM, CD-R, CD-RW, and DVD-ROM discs.

Unfortunately, the good news is tempered by a slew of gotchas. In testing the LaCie DVD-RAM External SCSI kit and the Hitachi drive, we encountered three disadvantages to upgrading to DVD-RAM. First, DVD-RAM kits could be hard to find for some time. Second, these kits may not include all the hardware you need. Third, and most significant, DVD-RAM drives exist for now on a virtual island, since the discs these drives create can only be read by other DVD-RAM drives and a few newer DVD-ROM drives. The DVD-ROM drives most people have in their PCs today won't be able to read DVD-RAM discs at all. Moreover, DVD-RAM drives can't create discs in CD-ROM, CD-R, or CD-RW formats, so you can't share archived data with anyone who relies on them.

AMONG THE FIRST DVD-RAM PRODUCTS to arrive: An upgrade kit from LaCie (left) and Hitachi's OEM-only drive.

FASTER THAN CD-RW

THE NEW DVD-RAM drives are certainly fast. To measure recording speed, we copied 315MB of multimedia files and programs from the hard drive of a Dell Dimension 333c PC to each DVD-RAM drive. The results: The Panasonic LF-D101 took less than 11 minutes to complete the transfer, while the Hitachi GF-1050 finished in just under 13 minutes. In contrast, a typical CD-RW drive spinning at 2X speed (or 300 kilobytes per second) takes roughly 18 minutes to transfer the same amount of data. Both the Hitachi and the Panasonic drives restored our 315MB of test data to the hard drive even more swiftly—in less than 5 minutes.

Using TestaCD Labs' DVD Tach and CD Tach benchmarks, we next measured how fast the new units played DVD-ROM and CD-ROM discs. When spinning DVD-ROM discs, both drives earned a perfectly adequate speed rating of 2.1X. (The first DVD-ROM drives transferred data at 1.385 MBps, thereby establishing the 1X DVD standard; all DVD "X" ratings are based on multiples of that.) Though the latest DVD-ROM drives achieve 5X DVD playback, no DVD titles are optimized for such high speeds. The Panasonic's 13.5X rating for playing CD-ROM discs beat out the Hitachi's 8X speed; each of these drives' speeds is entirely in line with its manufacturer's specifications.

SLOW TO MARKET

BUT YOU CAN'T GET those speeds if you can't find the drives—and so far, DVD-RAM drives are coming to market slowly. Currently, only Creative Labs, HiVal, and LaCie sell DVD-RAM upgrade kits, all based on Panasonic's drive; at press time, the Hitachi drive was unavailable in a retail kit. Both drive makers are negotiating with other kit vendors.

And kits are the only way you're going to get a DVD-RAM drive today: They won't be standard equipment in new PCs anytime soon. For one thing, they're too expensive, costing PC vendors two or three times as much as CD-RW drives to include in a system. More importantly, ▶

DVD-RAM DRIVES — SUMMARY

The Positive and Negative Spins on DVD-RAM

PROS	CONS
New storage format lets you record to and read 2.6GB (single-sided) and 5.2GB (double-sided) discs.	The first DVD-RAM drive kits—from Creative Labs, HiVal, and LaCie—cost $500 to $800.
DVD-RAM drives record 40 to 60 percent faster (400 to 475 KBps) than 2X (300-KBps) CD-RW drives.	The first drives require SCSI adapters, but the first kits may not include them or other needed hardware.
DVD-RAM drives read CD-ROM, CD-R, CD-RW, and DVD-ROM discs.	The drives create discs that only other DVD-RAM drives and the newest DVD-ROM drives can read.

PHOTOGRAPH: MARC SIMON

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DVD-RAM drives—like CD-RW drives—lack widespread appeal. PC vendors say they'll include DVD-RAM drives only in specialized configurations, such as graphic design workstations or corporate mass-storage file servers.

EXTRA HARDWARE REQUIRED

IF YOU DO buy an upgrade kit, be warned: It may not contain everything you need to get the drive up and running.

For example, the LaCie kit we looked at came with the drive, cables, one 2.6GB DVD-RAM cartridge, and software, but it didn't include a SCSI adapter, which the drive requires. (Creative Labs' DVD-RAM kit does include a SCSI card.) We used Initio's PCI-based FastSCSI-2 I/O Highway board to test the LaCie kit and the Hitachi drive.

Also, if you want to play DVD titles, and your PC isn't speedy enough for software MPEG-2 decoding (most vendors recommend at least a 266-MHz Pentium PC), you'll need to buy an MPEG-2 decoder board. Finally, if you want to record video directly onto your DVD-RAM drive (which vendors say is an important application for DVD-RAM), you'll need compatible video capture hardware.

At least the software shines. LaCie's kit and the Hitachi drive both came with a copy of Software Associates' Write DVD software. Unlike the recording software that accompanies CD-R or CD-RW products, Write DVD integrates itself directly into Windows. The program creates two new drive letters for your DVD-RAM drive, visible from Windows Explorer and My Computer. One of the drive letters becomes activated when you insert any CD media or DVD-ROM disc; the other displays DVD-RAM discs. You can simply drag and drop files to and from the DVD-RAM disc as you would to and from a hard drive.

BEST FOR BACKUP

IN THE SHORT term, because DVD-RAM discs are unable to play on today's DVD-ROM or CD-ROM drives, DVD-RAM drives are better suited for backup and archiving purposes than for data sharing. For the latter task, CD-R and CD-RW optical drives remain the devices of choice. As DVD-ROM drives that are capable of reading DVD-RAM media proliferate (products from Hitachi, Panasonic, Toshiba, and others are expected to arrive later this year), DVD-RAM drives will become more widely useful.

But another recordable DVD option looms large on the horizon, a second format called DVD+RW. Championed by the likes of Hewlett-Packard, Philips, Ricoh, and Sony, DVD+RW drives won't work with DVD-RAM media but will be compatible with DVD-ROM, CD-ROM, CD-R, and CD-RW discs. They'll store a little more data than DVD-RAM cartridges, too (3.0GB per side versus DVD-RAM's 2.6GB). DVD+RW drives should arrive by this summer, priced at about $600 to $800.

Given DVD-RAM's shortcomings, our advice is to wait on rewritable DVD technology for now, unless your backup and archiving needs are dire. By the time DVD+RW drives hit the market, we'll be able to see more clearly which optical storage format has the best long-term prospects.

—*Dean Andrews* ■

DVD-RAM External SCSI kit
$799 (street price); LaCie; 800/999-0670; www.lacie.com
PC WORLD INFONET NO. 722

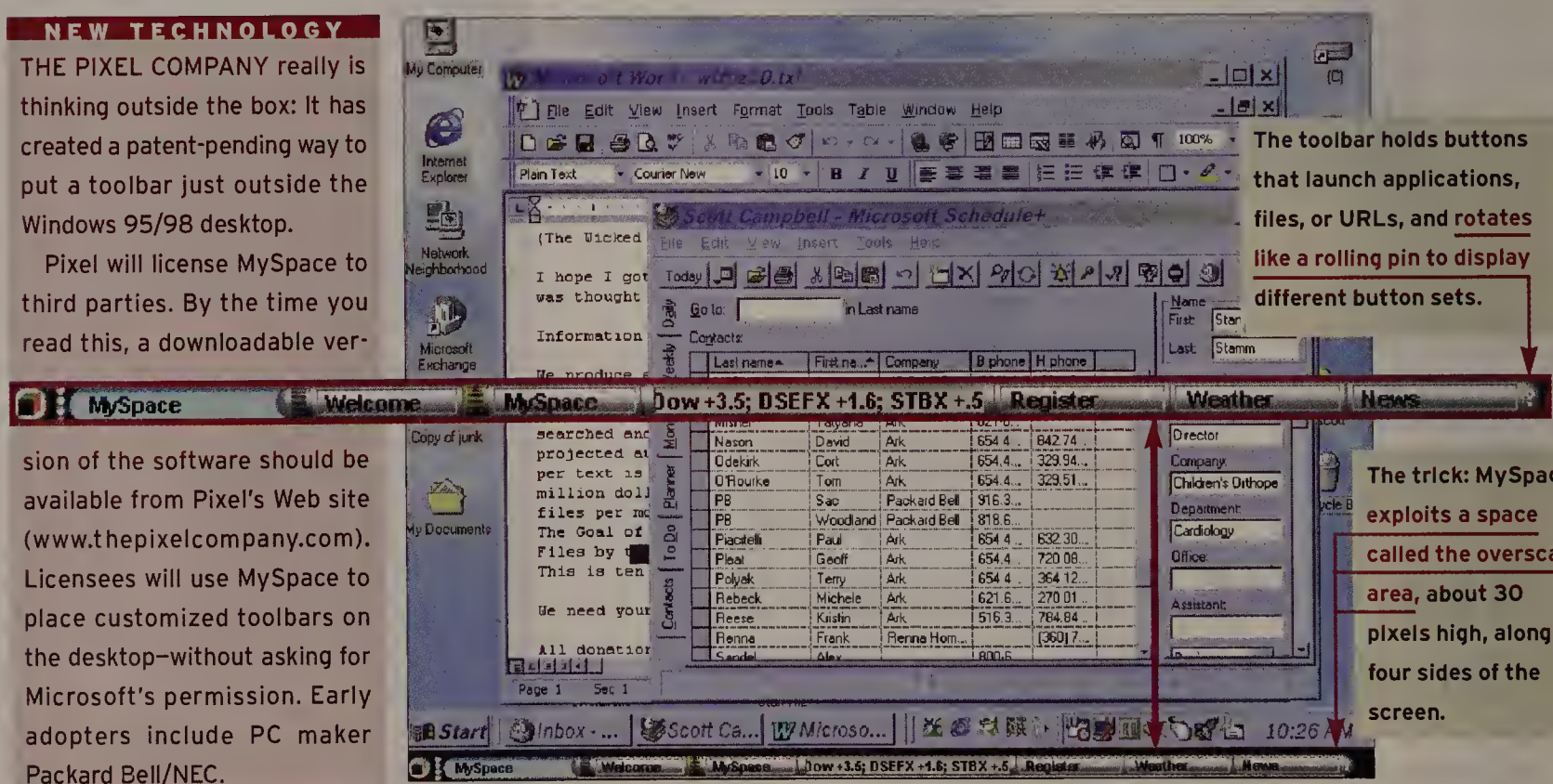
GF-1050 drive
(at press time, available to OEMs only)
Hitachi America; 800/448-2244; www.hitachi.com

Outside Your Window: MySpace Finds Room at Monitor's Edge

NEW TECHNOLOGY

THE PIXEL COMPANY really is thinking outside the box: It has created a patent-pending way to put a toolbar just outside the Windows 95/98 desktop.

Pixel will license MySpace to third parties. By the time you read this, a downloadable version of the software should be available from Pixel's Web site (www.thepixelcompany.com). Licensees will use MySpace to place customized toolbars on the desktop—without asking for Microsoft's permission. Early adopters include PC maker Packard Bell/NEC.



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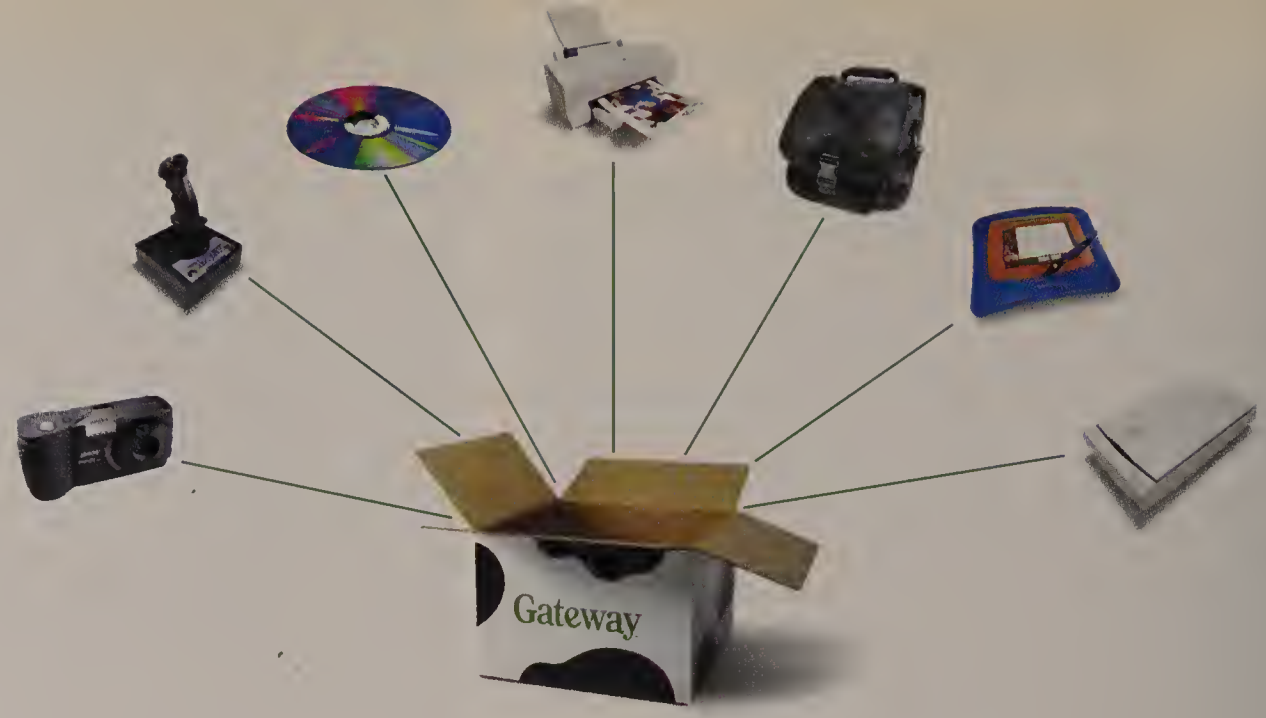

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PART ONE

MANAGER

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FRED COLLINS

With high-speed network connections and a widening array of mobile devices, it's easier than ever before to get all the information you need—when and where you need it.

When asked, "How many people work for you?" Henry Ford reportedly replied: "About half." That's probably as true now as then. Studies reveal that the average productivity for a 10.5-hour workday, including commuting, is around five hours.

That's not enough for highly driven, goal-oriented managers. That's why they're turning to low-cost, high-performance mobile technology that transforms free time into productive time.

In today's competitive climate, operating a successful business often requires you to go where the business is. When you arrive at your destination, you need to have ready access to detailed business records, and that means bringing data with you. New products such as Franklin Electronic Publisher's *(www.franklin.com)* REX PRO make

Hardware designed for mobile professionals keeps getting faster, smaller, better, cheaper and friendlier.

it easy and convenient. The 1.4-ounce, credit-card size personal information manager displays crisp text and sharp images and plugs directly into a laptop's PC card slot for fast synchronization with Microsoft Outlook and Lotus Notes.

Another lightweight problem solver is Everex Computers' *(www.freestyle.everex.com)* palm-size Freestyle Personal Digital Assistant. Despite its small size, the Freestyle's 16 MB of RAM and optional ProxiNet software, a dedicated graphical online browser, keep you connected to the Internet or your company's intranet.

AT A DISTANCE

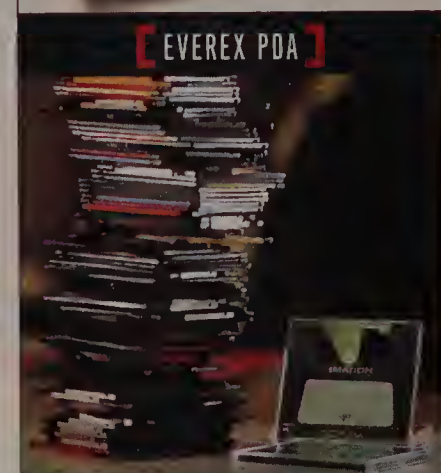
One key to increasing productivity is leveraging the time usually spent commuting or traveling, or eliminating it altogether by having some employees work from home.

"Productivity measurements of employees who work from home or at unsupervised remote sites indicate that most spend between 10% to 15%, and some up to 25%, more time working than do people who work in a traditional office setting," says Jack Gold, an analyst at Meta Group. "If you're sitting home and have a brainstorm, you probably won't do much about it," says Gold. "If you're not remotely connected, chances are you will not drive to the office to follow up. But if you have a computer at home, geography does not constrain you."

Before mobile professionals could achieve an appreciable level of efficiency, however, hardware vendors had to punch up the performance, features, and usability of their products. Software vendors introduced compact versions, as small as 75 KB, of their flagship database and office automation software. For example, 3Com's *(www.palm.com)* Palm III and Windows CE-based machines can now run enterprise-class software from Oracle, SAP, Sybase, Microsoft, Computer Associates, plus others. The availability of enterprise resource planning software further validates the Palm III and Windows CE devices as true mobile productivity tools.

[FRANKLIN REX PRO]

[EVEREX PDA]



[IMATION SUPERDISK]

[APC SURGE PROTECTOR]

Fortunately, other products designed to help mobile professionals stay connected adhere to the Immutable Law of Technology: Hardware gets faster, smaller, better, cheaper, and friendlier. Here are some examples:

- Daewoo Industries *(www.dwe.daewoo.co.kr)* flat-panel, lightweight displays are easier on the eyes, especially for extended projects, than the smaller screens that weight-constrained portable equipment typically offers. When used with a docking station, they offer the traveler the best of the mobile and desktop worlds: a compact footprint display with a sharp, color-saturated image.
- American Power Conversion's *(www.apcc.com)* portable SurgeArrest can help reduce the odds that transient power problems or telephone voltage spikes will damage your equipment. APC reports that nearly half of all data losses are caused by power problems. SurgeArrest installs inline with your laptop's power supply cable to protect your hardware and data. The eight-ounce device works with multiple voltages, making it suitable for use in the

If a 6.8 pound projector can influence the entire computer industry, imagine what it can do for your meetings.

Why would PC Magazine rank a humble projector company among the likes of Intel, Microsoft, and the other most influential companies in the computer industry? Good question. They said it's because In Focus is changing the way people use technology; more and more people are projecting from their laptop PCs, making the most of their meetings. They also said it's because of projectors like our revolutionary new 6.8-pound personal series—the ones that earned In Focus an Editors' Choice Award and made us the only projector company on the list. Our personal projectors are so small and so bright, you can project with the lights on. They've become the preferred choice of people everywhere who present on the road. And we've got a full line of industry-leading projectors for conference rooms and fixed installations, too. So for projectors that are affordable, reliable, and just plain make you look great, there's really only one choice. The number-one name in projectors—In Focus.®

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"Employees allowed to work at home are highly motivated, appreciative, and show it."—JACK GOLD, Mobile Technology Analyst, Meta Group

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▸ Imation's *(www.imation.com)* SuperDisk has a dual personality. In addition to saving and retrieving data on its own special 120 MB disks, its backward compatibility enables you to continue to use your standard 1.44 MB diskettes. SuperDisk drives are now available as a parallel port (external) model as well as an internal version that completely replaces the laptop's 3.5-inch diskette. In either case, the SuperDisk's ability to store up to 80 times more data than the standard 1.44 MB diskettes allow you to back up vital files easily on the road.

Analysts predict that during the next three years, vendors will continue to integrate once-dissimilar portable and fixed technologies to create ever-smarter devices that will help all employees work faster and smarter. Take Bluetooth, for example. Bluetooth *(www.intel.com/mobile/)* is a low-cost, short-range, wireless technology that will link laptops, mobile phones, beepers, PDAs, and other portable devices together in a "personal network."

Backed by Intel, IBM, Nokia, and many other vendors, Bluetooth will enable users to connect a wide variety of computing and telecommunications appliances within a 20- to 30-foot range without cables.

Bluetooth, like all advanced portable technology, removes yet another bump from the road that tomorrow's business traveler will traverse. In so doing, it allows business people to concentrate their efforts on their work, rather than the tools. ★

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Rugged outside, robust inside

THUNK! UH-OH. Your laptop just slipped off your shoulder and hit the ground. Unless you had it safely nestled in one of those bulky laptop carrying cases, you probably just caused some expensive damage or, even worse, lost your data.

Travel and technology will never be perfect partners, so Panasonic *(www.panasonic.com)* offers travelers a sleek option: a line of Toughbook laptops that resist the inevitable hazards of traveling.

[PANASONIC TOUGHBOOK]

The six-pound Toughbook's sleek, magnesium-alloy cases are designed to shrug off bumps and bounces that would damage most standard cases. A detachable handle lets you carry the Toughbook as you would a briefcase. The moisture-proof keyboards, touch pads, and LCD panels keep minor spills from becoming major disasters. On the inside, the units offer extensive protection for your data: All models come equipped with removable, vibration-resistant, Ultra-ATA hard drives encased in a shock-resisting polymer gel.

Beyond protecting your data and your investment, Toughbook delivers robust performance. Panasonic's newest model, Toughbook 71, offers a 300 MHz Pentium II for speedy processing and 64 MB of SDRAM. A crisp 13.3-inch TFT active-matrix display delivers a sharp, clear image indoors and out.

Wireless communications options allow you to use the units for remote network access, E-mail exchanges, and Internet connectivity. Other available options include a CD-ROM and an LS 120 Super Disk Drive.

At one time, similarly equipped laptops cost upwards of $10,000. Today's Toughbooks not only outperform those early machines but cost less than half that price. ★

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MOBILE MANAGER

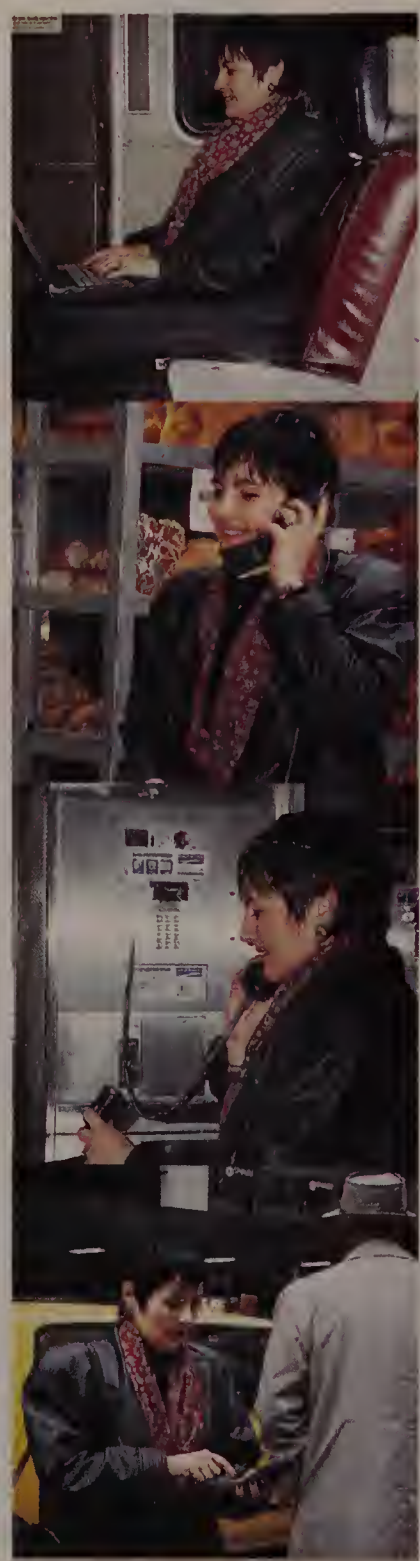
On the road again

"Technology empowers me. I have the flexibility to chose when and where I want to do things. The choice is mine."

NOT TOO LONG AGO, A commuter tapping on a laptop keyboard provoked stares of curiosity. Today, it's more of a curiosity to see a business traveler passing time by idly staring out of a plane or train window.

Georgia Saranofsky, director of New York Life's Field Technology Team, Agency Department, spends almost as much time commuting (three hours per day excluding delays) as she does at a desk. To maximize the use of her time and whittle down her workload, Saranofsky routinely carries a laptop computer, beeper, and cell phone to help her transform the "quiet time" during commuting into productive hours. "I don't have the luxury of uninterrupted time in the main office," says Saranofsky.

It's during her long daily commutes that she can test new software programs and tweak the PowerPoint sales presentations she plans to deliver during her monthly visits to New York Life's branch offices in Dallas and elsewhere.



THE WORLD IS HER OFFICE: Georgia Saranofsky doesn't waste a minute, whether she's commuting to work, rushing to an appointment, or checking in at the office. A laptop computer, beeper, and cell phone keep her connected to co-workers, clients, and family.

"The world I live and work in is not 9 to 5 any longer. Staying on top of projects and managing all the things I do requires more time than that. This technology enables me to keep up and helps keep me from getting overwhelmed," she says.

DIGITAL AT DAWN

A typical day for Saranofsky starts at 5:30 a.m. "I download my messages before I leave the house and answer them while on the bus." After answering her daily E-mail, Saranofsky reads through company memos and routine interoffice correspondence. "When I get to the office, I connect my laptop to a port replicator and upload my responses and documents to the company's intranet for distribution." With her long commuting hours and busy travel schedule, she uses her Compaq laptop as her primary link to colleagues. "I don't have a desktop computer. At the office I use the laptop for everything."

Her primary software includes a calendaring system with a "nagger" to remind her of pending deadlines, contact management, Microsoft Word, and Presentation. Microsoft Project Manager helps her track and manage the 10 to 15 projects she typically juggles.

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contact with colleagues and customers, Saranofsky's collection of portable wizardry keeps her connected to her family as well. That allows everyone who's important in her life to reach her quickly.

ONE OF A CROWD

Like a true road warrior, Saranofsky never leaves home on business without her ordnance.

"People wonder how it is that I never forget my 'gadgets'." It's simple, I always keep them together and make it a point never to leave them lying around where I might forget them." Many of her fellow commuters do the same so none of their commuting time goes to waste. "I'd say that 50% of the people I commute with carry a cell phone, laptop, and beeper. Most of them use them for business, but it's reassuring to have a cell phone handy for emergencies as well."

For all the many benefits of portable technology, it does have a downside. "Customers and colleagues know that I'm always accessible. If I don't call them right back, they wonder why not. Sometimes I can't stop what I'm doing and leave a meeting or disrupt a presentation."

As well equipped as Saranofsky is, what more ordnance might she want? "I'd like a personal digital assistant. I know that a PDA would work for me because the sooner I write something down, the more complete and accurate it is." Saranofsky says her company is currently field testing PDAs, but she plans to buy her own. "I can take notes with the laptop, but sometimes, I'd like a PDA because it's smaller and lighter."

One other technology she plans to adopt is an automatic voice transcriber. "I often use a small handheld tape recorder. I'm looking forward to the next generation of these recorders that can translate spoken words into written text." Dictaphone and Olympus have recently introduced such devices, and Sony says it will shortly release one. All three connect to a computer and upload the translated text directly into popular word processors.

Saranofsky's use of multiple devices exemplifies what Jack Gold, a mobile technology analyst at Meta Group, predicts will help shape the future of business travel. "Mobile technology has the potential to significantly change how we interact with our computer systems. Today we look at them as dedicated operations for word processing and other fixed tasks. But look three years into the future, and you will not be able to point to a single device and say 'this is my computer'."

Saranofsky maintains that the cost of acquiring the hardware is more than offset by the increase in productivity and reduced expenses. For example, she rarely uses a hotel's business centers when she travels, preferring to work from her room. "It's more convenient and more economical. For example, it typically costs $4 to have the hotel fax a one-page document. With my laptop, I can attach a Word document and send it as E-mail."

Will the proliferation of technology in Saranofsky's professional life eventually add to the problem instead of the solution? She thinks not. "Without this technology, I probably could not handle all that I do," she reasons. "I think that maybe I could do this job without this technology, but I hope I never have to." ★

"I never knew it would be so easy to connect to people when I need to talk to them. People count on me for fast answers."

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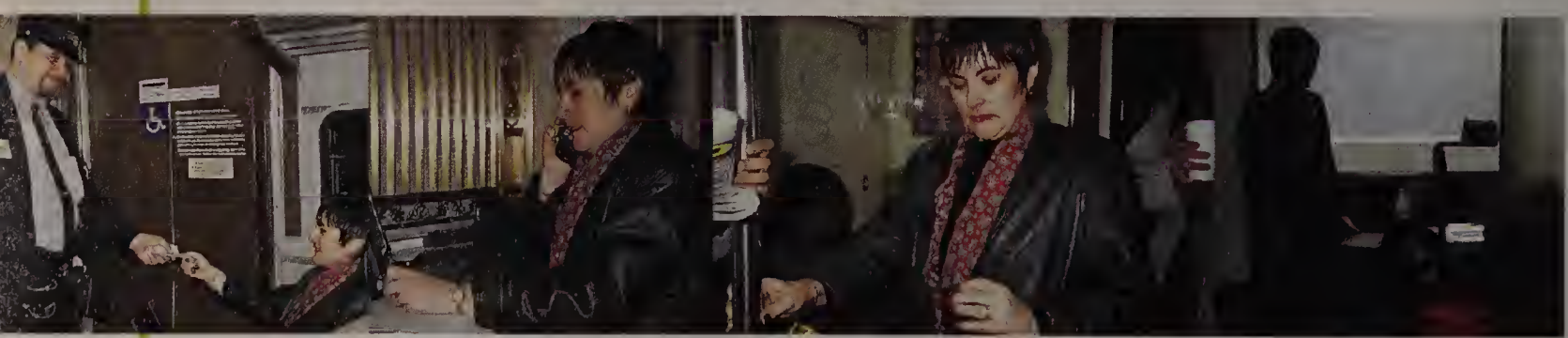

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SONY

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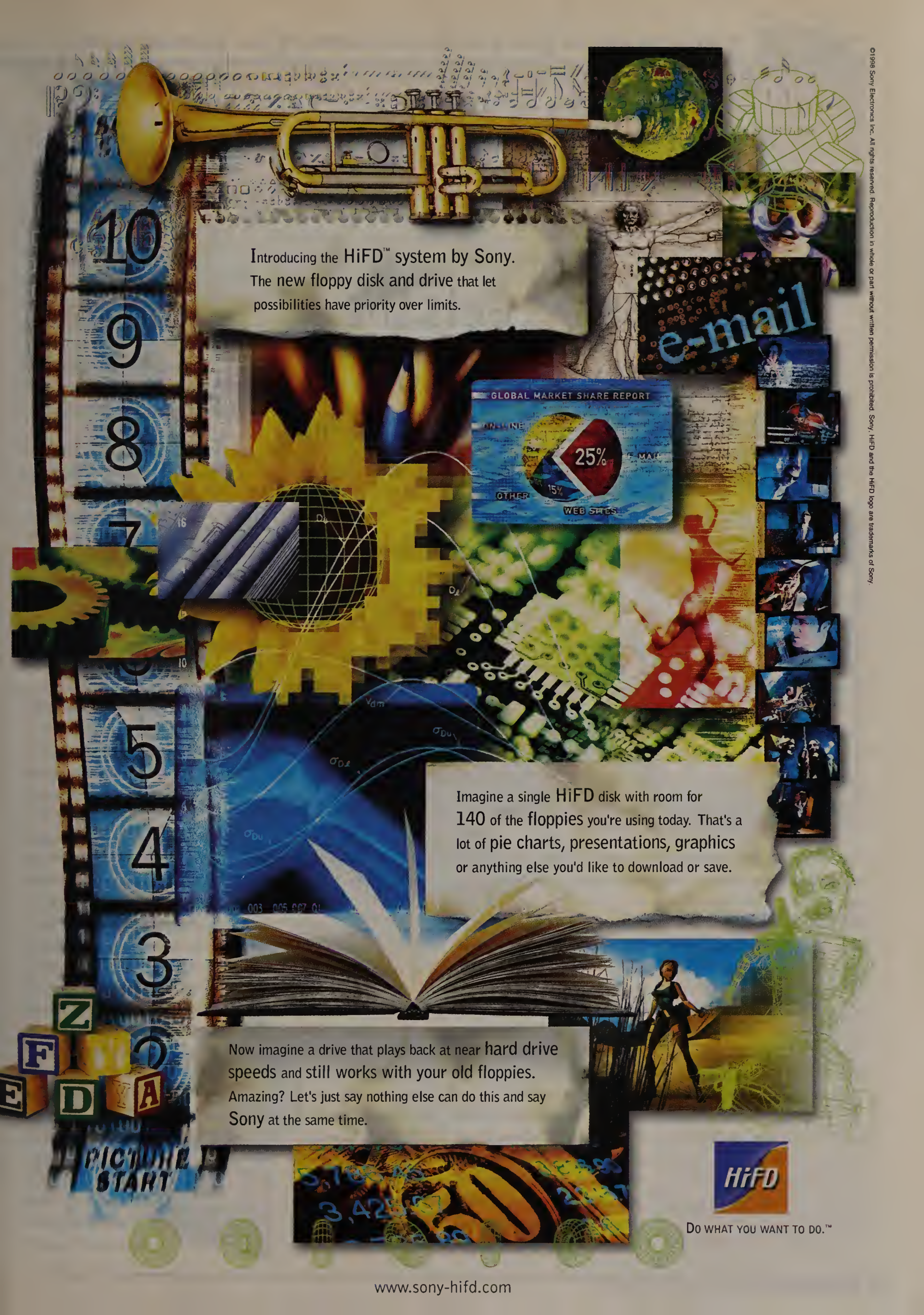

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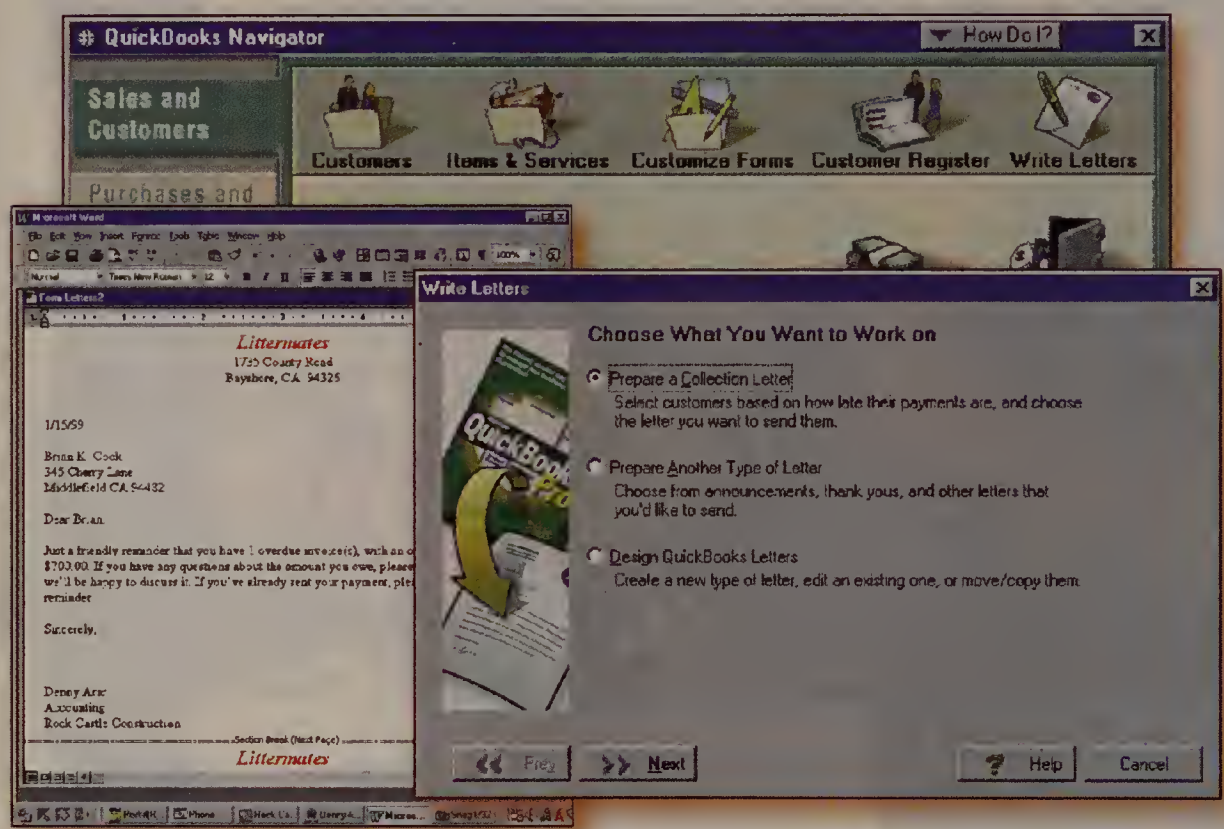
NEW PRODUCTS

QuickBooks Gets the Office Connection



NAGGING MADE EASY: QuickBooks Pro 99 users with Microsoft Office 97 can click on a new WriteLetters icon (at right of top screen) to generate mail from a menu (bottom right) using Word's mail-merge feature.

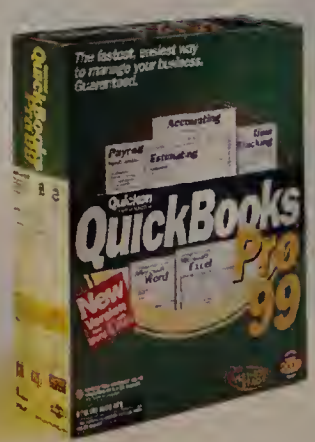
ACCOUNTING

IF YOU KEEP the books for a small business, you're probably using Intuit's QuickBooks. Its simplicity, power, and attractive design have long made it the runaway market leader. The newest upgrade, QuickBooks Pro 99, simplifies routine tasks for users who also work with Office 97: You can now write letters to customers and turn financial reports into spreadsheets without having to leave QuickBooks.

But QuickBooks Pro 99 arrives only six months after the last upgrade, QuickBooks Pro 6.0, added long-overdue support for multiple users on a network. Why the big rush? Intuit is playing catch-up. Competitors Peachtree and Bestware, which also led the way in networkability, introduced Office integration in their small-business packages last year and the year before, respectively. QuickBooks Pro 99 boasts several other innovations, but anyone who bought last summer's upgrade should think carefully about whether the added capabilities justify the hefty price tag.

TAKE A LETTER

THE INTEGRATION with Office allows QuickBooks to do some flashy tricks, including generating letters based on financial information. If, for example, you'd like to send debt collection letters to customers whose bills are 30 to 60 days past due, the program will present you with a list of qualifying delinquents. You can edit the list before the program launches Word and performs a mail merge to generate the letters.



You can choose from three prewritten collection letters (friendly, formal, or harsh) or write your own. QuickBooks Pro 99 one-ups the competition by enabling you to produce other types of letters as well—thank-yous for bill payments received, bounced check notifications, contract transmissions, and so on. Or you can create your own templates for mailings to customers, suppliers, or employees.

Integration with Excel lets you turn a QuickBooks report, including formulas, into a new worksheet—or add it to an existing one—with a single mouse click. This is useful if you want to manipulate data in ways QuickBooks can't.

Users who bill by the hour will appreciate the convenience of the new, built-in Stopwatch, which enables you to track time spent on a job by clicking at the start of that job and again at the end. Previously, you had to import this data from a separate QuickBooks Pro Timer application. (The Timer still comes with the program, incidentally, and it

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QuickBooks Pro 99

PRO: Can create Office 97 letters and spreadsheets from within the QuickBooks program.

CON: Expensive for users who just bought the last upgrade.

VALUE: Excellent small-business accounting choice. Upgrade worthwhile for those who didn't buy version 6.0; added convenience may justify expense for some who did.

Street price: $219 (single user); $599 (five-user pack).

Intuit
800/446-8848
www.quickbooks.com

remains useful for employees who don't have QuickBooks on their desktops but who need to generate time sheets.)

Other improvements apply to the $119 basic edition of the package, QuickBooks 99, as well as to the $219 Pro version ($599 for a five-user pack). You can now fill out deposit slips from your keyboard—but you have to order blank slips, with your account information preprinted on them in special ink, from Intuit at a pricey $35 to $55 per 250-slip package.

More useful from the standpoint of business accounting: QuickBooks now permits you to track cash back on deposits and attach purchase orders to customer accounts and jobs.

Finally, though QuickBooks 6.0 too is supposed to be Y2K ready, the 99 editions go a step farther by expressing all years in four digits rather than two.

Satisfied Peachtree and Bestware users will find no compelling reason to switch, but QuickBooks Pro 99 should help keep existing customers loyal—especially those with older versions who were thinking of upgrading anyway. But if you already use QuickBooks Pro 6.0, upgrade only if you need the Office integration and other new business management features.

At least recent upgraders get a bit of a break on rebates: QuickBooks Pro 6.0 owners can recoup $90 ($200 for a five-pack), compared to $70 (and $100 for a five-pack) for owners of earlier versions.

—*Yardena Arar*

FOR MORE PRODUCT news and the latest announcements, check out the PC World Daily News Service at www.pcworld.com/news.

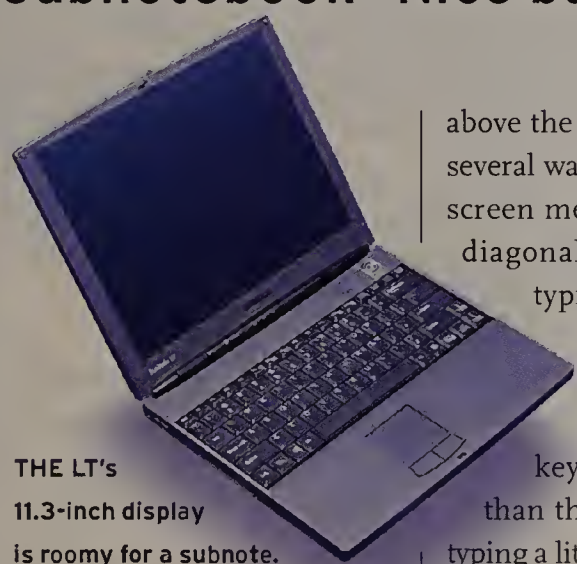
Dell's Copycat Subnotebook—Nice but Pricey

SUBNOTEBOOK

IF IMITATION IS the sincerest form of flattery, the Sony VAIO 505 ultraslim subnotebook should be blushing at the slew of knockoffs it has inspired. One of the newest, Dell's Latitude LT M266ST, slightly outdoes the VAIO, but is also a little more expensive.

Like the VAIO and other ultraslims, the Latitude boasts a svelte 1-inch profile, a touch-typable 10-inch-wide keyboard and a Pentium MMX CPU. Its light heft (4-plus pounds with AC adapter and external floppy drive) and its internal modem make it ideal for frequent travelers tired of lugging around a standard 8-pound laptop.

A preproduction unit with a PMMX-266 CPU, 256KB secondary cache, and 64MB of RAM chalked up a PC WorldBench 98 score of 118—about average for this configuration and plenty fast for running basic work applications. The Latitude's battery life in our tests (1 hour, 51 minutes) was unimpressive for a conventional notebook but fairly typical for an ultraslim subnote. An optional second battery lets you work longer while on the road, but adds nearly a pound to the unit's traveling weight.



THE LT's 11.3-inch display is roomy for a subnote.

The Latitude LT ranks a cut above the other ultraslims in several ways. Its active-matrix screen measures 11.3 inches diagonally, compared to a typical 10-plus inches (the VAIO 505's is 10.4 inches). The Latitude LT's keys travel a bit more than the VAIO's, making typing a little easier. Dell's on-site repairs and toll-free tech support for the life of the product beat Sony's service policy.

The Latitude has two deficiencies, though: It ships with Windows 95, not Windows 98. And at $2299, it's $300 more than either the Sony or Toshiba's VAIO copycat, the Portégé 3015CT. No matter which ultraslim you buy, you'll probably want to spend another $299 for an external CD-ROM drive. For that kind of money, you could buy a bulkier Dell Inspiron notebook with the fastest mobile Pentium II CPU available. More ultraslim portables are on the horizon, so we'd advise you to shop around.

—*Vince Bielski* ▶

Dell Latitude LT M266ST

PRO: Large screen for a subnotebook, usable keyboard, very light.

CON: Pricey, CD-ROM drive not included in standard package.

VALUE: Costlier than competitors but provides better service and features.

Street price: $2229

Dell Computer
800/388-8542
www.dell.com

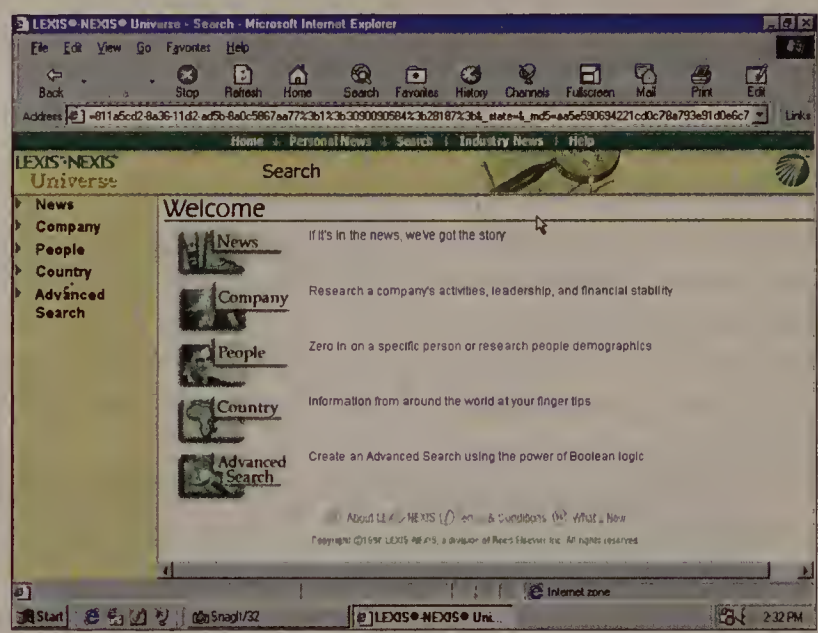
PC WORLD INFONET NO. 735

THIS PRODUCT has been evaluated using tests designed by the PC World Test Center.

Lexis-Nexis Universe: Not Universally Useful

WEB SITE

LEXIS-NEXIS is a vast network of online databases containing everything from newspaper and magazine articles to legal briefs, financial reports, and public records. But until recently, access to it via the Web could be confusing; and only law offices, libraries, and other institutions with hefty research budgets could afford subscriptions, which cost at least $150 per month. Lexis-Nexis's new Universe service offers cheaper subscriptions and access via a standard Web browser.



RESEARCH CENTRAL: Lexis-Nexis's Universe service offers Web-based access to legal documents, financial reports and general news.

For single users, fees start at $55 per month for access to articles in the News database going back 90 days. The $250-per-month account that I tried out provides unlimited access to News, People, Companies, and Countries databases going back at least 25 years.

Results were mixed. On the plus side, Lexis-Nexis clearly did its Web design homework. The Universe site is simple, pleasingly elegant, and dead-easy to navigate; I could even e-mail my search results directly from the browser.

But the mix of sources can produce unsatisfactory results, at least for general subjects. A search on "Microsoft court" brought up 72 articles on the Microsoft antitrust trial from such diverse sources as the *Irish Times* and the *Seattle Post-Intelligencer*—but nothing from the *New York Times* or the abstracts collection of the *Wall Street Journal*, both of which are listed in the index. Some major magazines aren't represented at all.

Universe might be the way to go for legal documents and public records. But for general research, you'll be just as well off (and a lot richer) sticking with a free search engine like HotBot, Lycos, or AltaVista.

—Bryan Hastings

Lexis-Nexis Universe

PRO: Very easy to use, can easily e-mail search results.

CON: Results can be irrelevant.

VALUE: Better for financial and legal research than for general news and people profiles.

Price: $55 to $575 per month for single users; volume discounts apply.

Lexis-Nexis

800/227-4908

www.lexis-nexis.com

PC WORLD INFONET NO. 736

Aiwa, Sony Offer Affordable 10GB Backup

TAPE BACKUP

TODAY'S BIG, inexpensive hard drives can store large programs and tons of data. But with the average hard drive capacity of a new PC now at 8GB, even half-full drives exceed the capacity of many tape backup devices. Two new tape drives—Aiwa's Bolt and Sony's SuperStation—use tapes that can hold nearly 10GB of compressed data. Priced at about $150 (internal) to $180 (external)—roughly the same as lower-capacity competitors—they're also eminently affordable.

Both drives come in internal EIDE and external parallel port models; both use the same Aiwa mechanism; and both come with Seagate's fine backup software for Windows 95, 98, and NT Workstation.

As expected, my shipping Sony parallel port model (with printer pass-through) was the easier model to install; the shipping internal Aiwa drive required a bit more work to set up. I had to open my PC's case, screw in the drive, attach it to the second connection on my EIDE CD-ROM drive cable, and plug in a power lead.

But once installed, the internal Bolt drive worked faster, taking only 38 minutes to back up my 400MB test drive and a mere 11 minutes to restore the files. In contrast, the SuperStation took about 46 minutes to back up and verify 400MB of files and about 22 minutes to restore them. Both units ran smoothly and quietly.

Each drive is protected by a two-year warranty, but Sony offers buyers longer phone support hours. You can buy storage media in two capacities: 6.6GB ($25) and 10GB ($35). Both drives are excellent, so Sony's longer support hours might be the tiebreaker.

—Rex Farrance ▶

Aiwa Bolt

PRO: Affordable mass storage.

CON: Support hours could be longer.

VALUE: Inexpensively accommodates large backups on a single tape.

List price: $149 ($179 external)

Aiwa America

888/297-3004

www.aiwa.com/csd

PC WORLD INFONET NO. 737

Sony SuperStation

PRO: Affordable mass storage.

CON: Nothing significant.

VALUE: Same storage and performance capabilities as the Aiwa, with longer tech support hours.

List price: $150 ($180 external)

Sony Electronics

888/369-0685

www.sony.com/superstation

PC WORLD INFONET NO. 738

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And picture this — the smallest, brightest projection systems on the market deliver graphics so vibrant and film-like you won't believe your eyes. DLP technology's unique digital light displays 16.7 million digitally correct colors. And DLP technology's digital design creates a clearer, seamless image, unlike LCD technologies that suffer from the infamous "screen door" effect.

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OPENING THE WORLD'S EYES TO THE BRILLIANCE OF DIGITAL IMAGES.

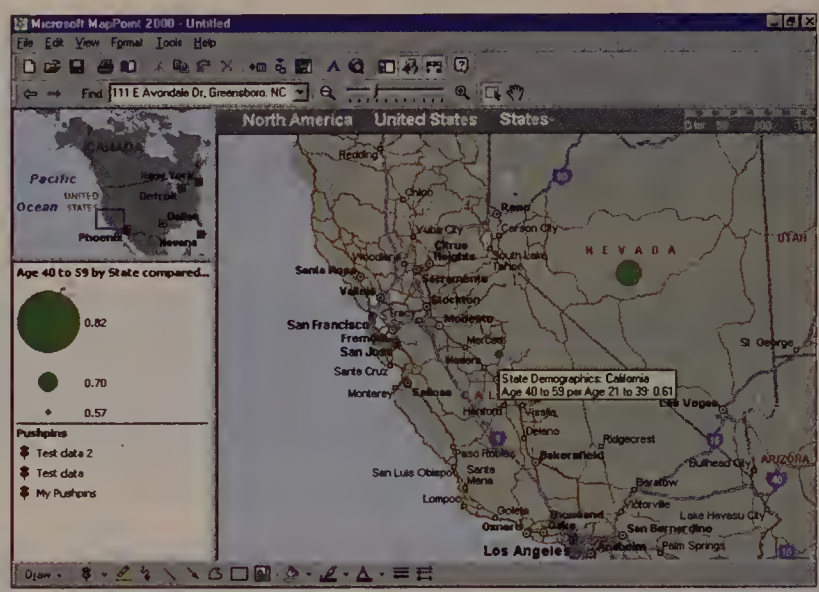
TEXAS INSTRUMENTS

Pictures Not Enough? Draw a Map

MAPPING

WORDS, GRAPHICS like bar or pie charts, and even emphatic hand gestures aren't always enough to get a point across concisely and powerfully. Sometimes, I feel the need to draw a *map*. Not just any map, but one that makes the geography meaningful. A map that can show me, for example, how many latte drinkers there are compared to smoothie fanatics, by zip code.

Microsoft's **MapPoint 2000** ($109) and ESRI's **BusinessMap Pro 2.0** ($130) do exactly that: They combine detailed geographic maps with demographics. You can geographically pinpoint U.S. census data that comes with the programs, or import your own statistics.



MAPPOINT 2000 HAS attractive maps and a familiar Microsoft interface, but its database isn't as robust as BusinessMap Pro's.

The resulting maps are useful for sales projections, expansion planning, and other research projects and proposals. I tested a beta version of MapPoint and a shipping version of BusinessMap Pro.

Microsoft's MapPoint 2000 is an easy-to-use program for those with basic mapping analysis needs. The interface will be familiar to Microsoft Office users, and MapPoint 2000 imports data from Excel, Outlook, Access, and text files, or other programs that support Microsoft Data Link (the Office 2000 counterpart to the ODBC protocol for databases). It also includes a useful demographics database that's derived from U.S. Census Bureau numbers and other sources, letting me do such things as display ratios of age groups by state; compare urban versus rural populations; or get a breakdown of minorities by county.

Once you've assembled your data, the maps are attractive and easy to work with. Drawing tools let you easily add highlighting, text boxes, and other annotations; and adding or embedding maps as editable objects in Word, PowerPoint, and other Office files is a snap. Our only major complaint: There's no undo feature.

BusinessMap Pro 2.0 is more powerful than MapPoint 2000, but with all the extra features, it is also more challenging to learn. Other drawbacks: The program lacks the comfy MapPoint 2000 interface; the maps are downright ugly; and its drawing and annotation tools are limited.

POWER ADD-ONS

BUT BUSINESSMAP PRO'S two optional extensions put the program, pardon the pun, on the map. Market Analyzer provides a wealth of U.S. demographics, including year 2002 census projections; Business Tracker has a helpful database of 11 million U.S. businesses. Both are included in the four-CD box, but you must call a toll-free number and pay $350 to unlock the software; unlocking just Business Tracker costs $50. You can import data from most common contact managers, databases, and spreadsheets, including Excel. Unfortunately, Outlook and the current version of Access are not supported in their native formats.

I would recommend MapPoint 2000 for those with basic, occasional mapping needs: It is inexpensive and easy to use. However, if you need to map data often for analysis or presentations; could use a wealth of ready-made statistical information; and aren't afraid of complex software programs, then BusinessMap Pro and its extensions are a worthwhile, if heftier, investment.

—James A. Martin ▶

BusinessMap Pro 2.0

PRO: Powerful data mapping capabilities.

CON: Ugly maps; limited drawing and annotation tools; full package with extensions is costly.

VALUE: Good for heavy-duty, continual mapping; optional extensions expensive but useful.

Street price: $130

ESRI

800/465-8972

www.esri.com/businessmap

PC WORLD INFONET NO. 710

MapPoint 2000

PRO: Easy to use; attractive maps; useful demographic data; affordable.

CON: No drawing undo feature; not as data-rich as BusinessMap Pro.

VALUE: Good for casual, occasional mapping projects.

Street price: $109

Microsoft

800/426-9400

www.microsoft.com/mappoint

PC WORLD INFONET NO. 711

QUICK TAKES

Use a Palm as a Pilot

MAPPING PROGRAMS for PalmPilot devices aren't new, but most only cover large areas with lots of single-screen maps. MarcoSoft's **Quo Vadis** ($65) lets you scroll through street-level maps for most U.S. locations. Registered users can download all maps free from MarcoSoft's Web site. When you install maps of adjacent cities within a county, Quo Vadis seamlessly connects them like interlocking jigsaw pieces. Global Positioning System support provides real-time location tracking for users with a GPS antenna. You can zoom in and out on maps to show everything from street views to county views. A Palm's tiny memory limits the number of maps that you can store, and the small screen precludes large map views. Still, I found Quo Vadis a handy resource. MarcoSoft; 650/326-4727; www.marcosoft.com.

PC WORLD INFONET NO. 712

—Michael S. Lasky

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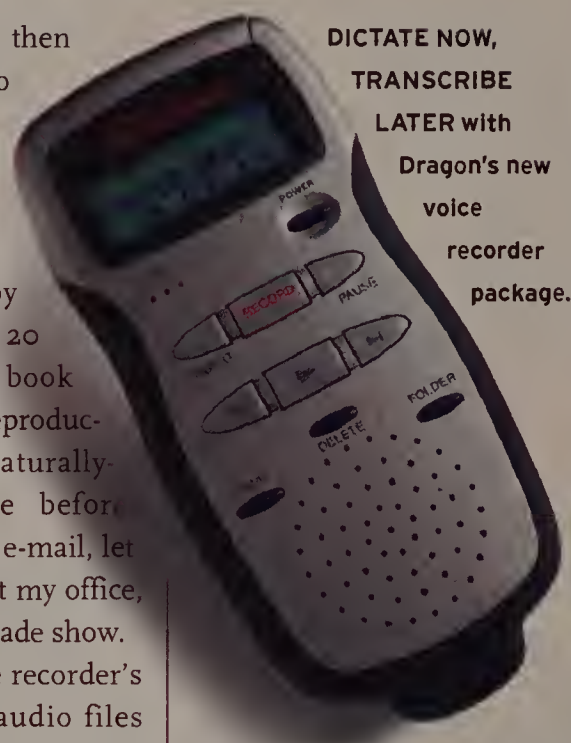
Speech Recognition for the Road

SPEECH RECOGNITION

DRAGON SYSTEMS' new $249 dictation package, **NaturallySpeaking Mobile**, lets you do your talking while you're walking. It combines a pocket voice recorder and NaturallySpeaking voice recognition software. You create, edit, and format documents by dictating into the recorder. Once back in your office, you connect the recorder to your PC's serial port and download your dictation; the software then transcribes it into editable text.

As with most speech-recognition products, you have to begin by training it. I spent 20 minutes reading book excerpts into a preproduction version of NaturallySpeaking Mobile before using it to dictate e-mail, letters, and reports at my office, an airport, and a trade show.



DICTATE NOW, TRANSCRIBE LATER with Dragon's new voice recorder package.

Dragon says the recorder's compression of audio files hampers the software's speech recognition ability, at least initially, and my tests bore this out. While both recorder and software were super-easy to use, accuracy was disappointing at first. Scores of words were botched—"thanks" was interpreted as "flanks," "Lisa Leno" as "let me know," and so on. The software understood most instructions ("new paragraph," "scratch that"), but it had problems with formatting requests like "bold that." Two more 20-minute training sessions improved accuracy, as did my editing corrections. But it took a month of use for the product to become truly convenient.

You'll need at least a Pentium-133 computer with 32MB of RAM (I had a Pentium II-450 with 128MB of RAM). The chic 4-ounce recorder runs on two AAA batteries. Dragon also bundles a copy of NaturallySpeaking Preferred, its excellent $160 desktop dictation program (see "Can We Talk?" January, www.pcworld.com/jan99/talk).

People who want to take notes or write drafts on the road will find Dragon's mobile product convenient, so long as they're prepared to do a fair amount of editing later. But for more formal work—like dictating letters—NaturallySpeaking Mobile has some catching up to do to keep pace with more advanced desktop programs like NaturallySpeaking Preferred.

—Aoife McEvoy

NaturallySpeaking Mobile

PRO: Easy to use recorder, great for downloading dictation to a PC.
CON: Initial accuracy is spotty.
VALUE: Convenient for dictating drafts and notes while traveling.
Street price: $249
Dragon Systems
800/437-2466
www.dragonsys.com
PC WORLD INFONET NO. 713

NetZip Deluxe: Quick Web Unzip Fix

UTILITY

I'LL BE HONEST. I use WinZip all the time—not because it's the most feature-packed compression utility, but because I've always used it. Software Builders' **NetZip Deluxe 6.3**, which adds such features as the ability to resume an interrupted download, could break my WinZip habit. I tested a shipping version.

NetZip ($30) offers WinZip's ease of use, intuitive interface, and support for multiple compression formats—and adds a lot of functionality for a bit more money (WinZip costs $22 apiece for two to nine licenses). The interrupted-download feature alone is worth the extra 8 bucks: If your Internet connection breaks during a download, NetZip lets you pick up where you left off, rather than having to restart from scratch. This feature works in conjunction with your browser for any Web download. Other utilities—GetRight and Download Butler, for example—can do the same but don't have NetZip's other attractions.

NetZip also simplifies the download-unzip drill. Click on a compressed file, and NetZip launches automatically, showing the download's progress and displaying the archived files in your browser. When the download is done, you can immediately view, extract, and/or launch the archived files. (WinZip doesn't work directly through the browser.)

Like WinZip, NetZip lets you compress and decompress files to save on storage space or to e-mail compressed attachments. And as with Mijenix's ZipMagic, files in a NetZip archive look and act as if they were in Windows Explorer: You don't have to open up a compression utility just to use the files inside.

WinZip 7.0 is more customizable than NetZip, but NetZip's superior functionality makes it a good deal, even at its higher price. I only wish it came with better documentation than the included help files and FAQs.

—Cameron Heffernan ▶

NetZip Deluxe 6.3

PRO: Resumes broken Internet downloads; downloads and unzips files in one step.
CON: No product manual.
VALUE: A time-saving utility that's easy to use.
Street price: $30
Software Builders Int'l
800/432-0025
www.netzip.com
PC WORLD INFONET NO. 714

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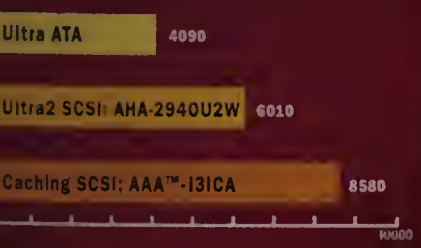

Performance data: Ziff-Davis WinBench 98 High-End Disk WinMark Score, running in Windows NT® on a 300MHz Pentium II with 64MB of RAM.*

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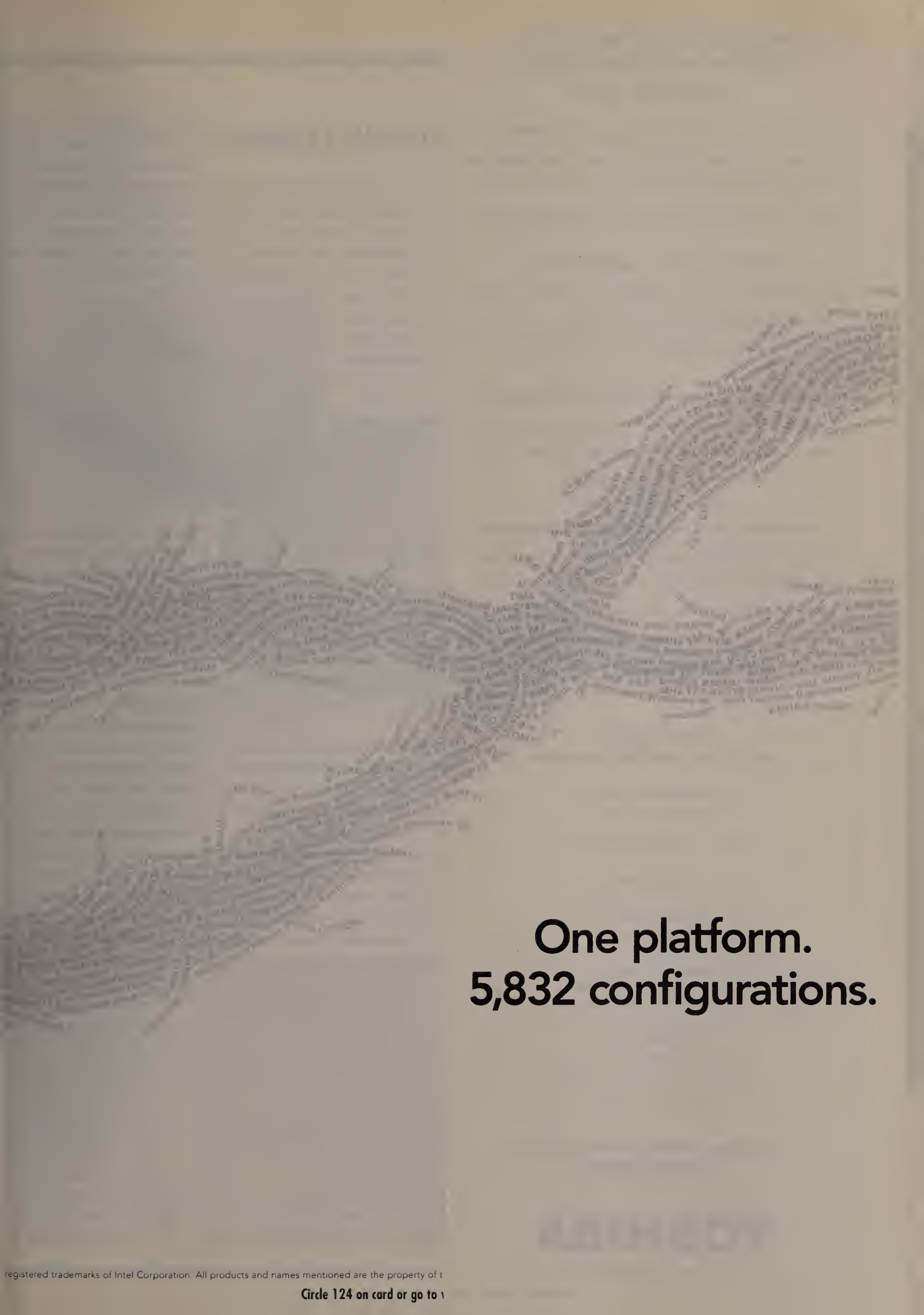

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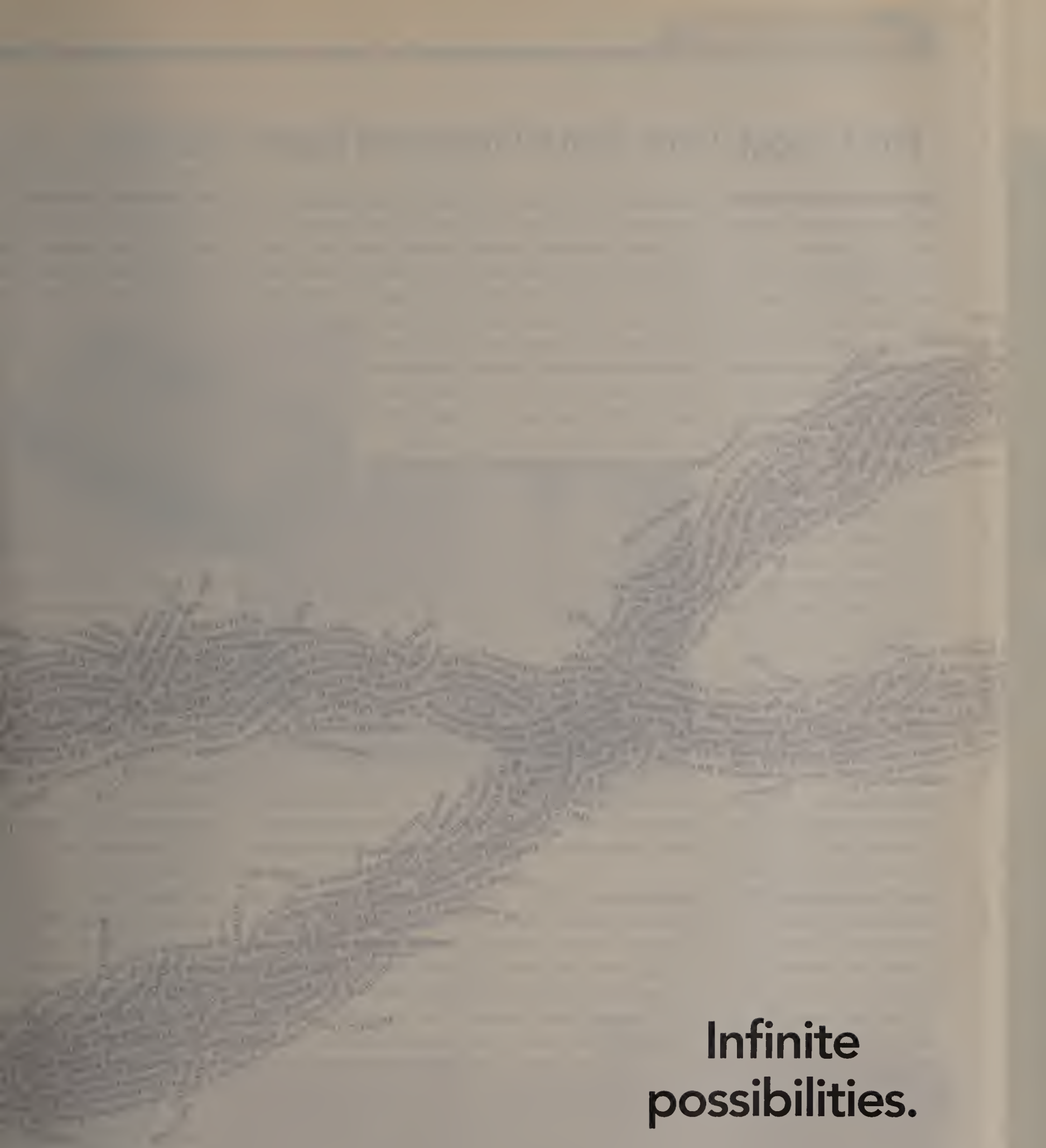

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Toshiba has built proprietary notebook-specific features into LANDesk® Client Manager 3.3 for improved manageability—like fault management, system diagnostics and remote and local system monitoring, configuring, and updating. The configurable Tecra 8000 also offers DMI 2.0 BIOS support for asset tagging and system identification. As *PC Magazine* recently raved, the newest Tecra is "notebook nirvana."

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Point, Shoot, Print: Digital Photos Get Easier

DIGITAL PHOTOGRAPHY

DOES YOUR DIGITAL camera keep you tethered to a PC? Sure, you need a computer to edit, e-mail, or post your digital photos on the Web. But three new products let you make quick printouts without hooking up cables and opening your images in a graphics program first—in short, without using a PC.

Syntran's $150 **CamPrint**—a device about the size of your jacket pocket—connects compatible digital cameras directly to a printer. Push a few buttons to select photos and size; a switching device lets CamPrint and your PC share a printer. Yes, the idea is clunky—what, another gizmo, more cables? But my shipping version worked fine, even with my Olympus D-500L, which wasn't among the 22 cameras CamPrint officially supports.

More elegant in conception and execution is Lexmark's $349 **Photo Jetprinter 5770**, a standard ink jet printer outfitted with an LCD-equipped control panel, slots for SmartMedia and CompactFlash memory cards, and a Zip drive adapter. Slip your camera's media into the appropriate slot, then use the LCD settings to produce thumbnails, select images to print, and even add a few hokey special effects. Print quality of photos that I made using a shipping unit looked fine on ordinary ink jet paper, and striking on Lexmark's Inkjet Photo Paper.

Finally, Polaroid's $299 **ColorShot** printer with the company's $99 Direct Connect accessory will let you print straight from your camera to the company's widely available, $1-a-shot Spectra Instant Film or its slightly cheaper but hard-to-find ColorShot stock that delivers the same quality. Direct Connect wasn't ready for testing, but I tried a shipping version of the printer with a parallel port connection (a USB version is also available).

TWO PATHS TO PC-FREE PHOTO PRINTS: Syntran's Camprint (top) works with a printer; Lexmark's Photo Jetprinter 5770 stands alone.

The advantage of printing digital photos on a Polaroid-media printer instead of using a Polaroid camera? You can print images from the Web or from other sources. And because a digital camera, unlike a Polaroid camera, saves images, you can make multiple copies or edit them on your PC. But if you dislike heavy, old-fashioned 3⅝-by-2⅞-inch photos of conventional Polaroid cameras, you won't like ColorShot prints either—and the small-format printer isn't really good for much else.

Each of these products eliminates the need for a PC to print digital photos. The CamPrint is the quick, easy, and relatively inexpensive fix—if you're happy with your current printer and if it supports the device. Polaroid's package may please fans of Polaroid photo who want to go digital. But if you plan to buy a printer anyway, Lexmark's integrated system makes the most sense, combining a good general-purpose printer with a digital-photography studio. You don't even need to attach your camera to it, because photos travel on wafer-thin flash cards.

One disadvantage, however, applies equally to all three of these products: They require AC power. That means you can simplify the process of getting to your images, but if you need the photos while you're out in the field, then a conventional Polaroid-style instant camera may turn out to be a more practical option.

—Dan Littman

CamPrint

PRO: Connects a printer and digital camera, lets you print photos without using a PC.

CON: Adds more cables and a power cord to your desktop.

VALUE: Convenient, fairly priced gadget for quick digital photos.

Street price: $150

Syntran Color Imaging

408/573-1788

www.syntran.com

PC WORLD INFONET NO. 715

ColorShot

PRO: Used in conjunction with the Direct Connect accessory, lets you print photos without a PC.

CON: Small-format printer; highly specialized.

VALUE: Most people may prefer a conventional Polaroid camera.

List price: $299

Polaroid

800/343-5000

www.polaroid.com

PC WORLD INFONET NO. 716

Photo Jetprinter 5770

PRO: Versatile, high-quality printer enables you to generate photos without a PC.

CON: Special-effects features are on the hokey side.

VALUE: Elegant and speedy photo-printing on a solid, all-around ink jet.

Street price: $349

Lexmark Int'l

800/539-6275

www.lexmark.com

PC WORLD INFONET NO. 717

Affordable, Easy Video Razzle-Dazzle

VIDEO CAPTURE

THE LAST TIME I tried to capture video on my PC, I cut two fingers jamming an ISA card into a free slot, banged my head on a shelf while attaching cables to the back of the box, and force-fed my hard drive so many motion-JPEG files that the system choked.

This time, things were different. With a shipping copy of **Dazzle Digital Video Creator**, all I had to do was plug a cable into my parallel port; I never had to crawl behind my PC again. All video and audio ports (in and out) come in a compact miniature tower that sits right next to my monitor.

Dazzle's software is even more appealing than the hardware. The sleek, intuitive interface looks like an electronic toy, with buttons that call up task-specific control panels for editing video and organizing multimedia clips.

Dazzle captures and saves video from a camcorder, a VCR, or any device with a composite or S-Video connector, in MPEG-1 format—a far more universal and compact video format than motion-JPEG or AVI. The only downside is that MPEG is not as editable as M-JPEG. Dazzle lets you split MPEG clips, trim them, and splice them together—as long as they're in exactly the same format, down to their bit-per-second processing rates and window sizes. This is easy for clips captured using identical Dazzle format settings; blending in video from the Web may be difficult.

Beyond cutting and splicing, you can do little editing with Dazzle (the company says the next version will offer more effects). But you can easily share your videos. Click one button to attach a clip to an e-mail message; click another to put it into a simple Web page ready for posting on your site.

At $249, Dazzle is one of the most affordable MPEG video capture packages available, suitable for a range of personal and business uses, such as training or Web marketing. Just make sure you get the latest software from the company's Web site: Dazzle released a new version in the middle of my evaluation.

—Brad Grimes

Dazzle Digital Video Creator

PRO: Easy-to-use video capture device, great software interface.

CON: Editing ability is limited.

VALUE: A great way to get MPEG video clips into your PC and then out onto the Web.

Street price: $249

Dazzle Multimedia

510/360-2300

www.dazzle.com

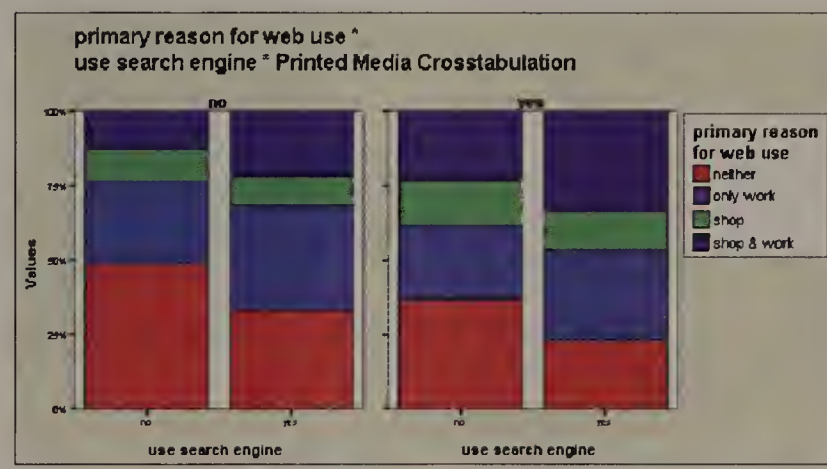
PC WORLD INFONET NO. 729

SPSS 9: Picture-Pretty Statistical Analysis

STATISTICS

LONG POPULAR with scientists and statisticians, SPSS statistical analysis software in recent years has become useful for businesspeople as well. SPSS 9 ($795) not only boasts visuals on a par with the best business presentation packages, it also provides wizards for importing all sorts of data and introduces powerful techniques that are moving from statistics cubbyholes into marketing departments. I looked at a preproduction copy.

Graphics, which can now be generated from tables with a few mouse clicks, include basics like the stacked-bar chart shown above. But new options abound. Sophisticated users will appreciate 3D spike charts for a detailed look at a proposed model's fit to data; business users will enjoy creating *USA Today*–style charts with bars made of symbols (flags, dollar signs, barrels, and so forth). Using features from the top-notch graphing program DeltaGraph (which SPSS now owns), SPSS 9 acquires a boardroom look to go with its business smarts.



STACKING UP: SPSS's new stacked-bar charts let you summarize and deliver complex statistics tables using an easy-to-read graphic.

SPSS's basic package now includes some advanced statistical topics from its series of SPSS modules ($495 each). If you're still exploring statistical functions in Microsoft Excel, you may know little about things like multinomial logistic regression. But that function is a powerful business decision-making tool, and it's now part of the basic package. Advanced users should consider the Trends module for forecasting, and Exact Tests (or its industrial-strength companions StatXact and LogXact) for squeezing the most out of surveys and market tests.

Version 9's combination of powerful statistical methods and graphic output, ranging from austerely scientific to trade-show flashy, makes it the only program you need for finding patterns in business data and using them to convince people you're right.

—Charles Seiter ▶

SPSS 9

PRO: Impressive business-presentation graphics, best introduction to new applied-statistical methods.

CON: Not for casual users.

VALUE: Serious but worthwhile investment.

List price: $795

SPSS

800/543-2185

www.spss.com

PC WORLD INFONET NO. 730

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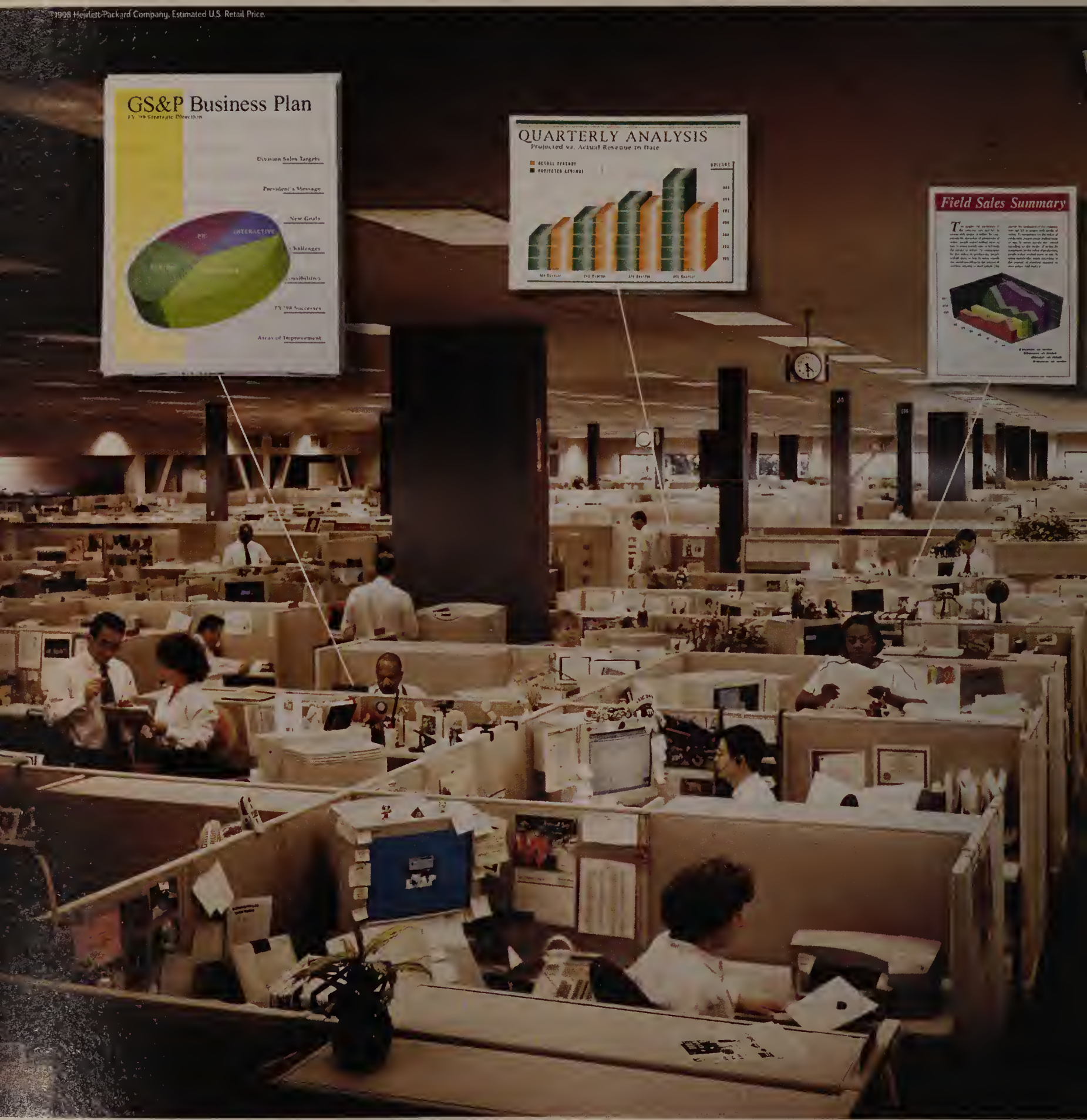

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Publisher 2000 Goes Professional

DESKTOP PUBLISHING

MICROSOFT PUBLISHER, a popular desktop publishing tool for users with little or no design experience, wants to help you make your documents look more professional. Now in public beta, **Publisher 2000** looks and feels much like the previous version, but it adds tools to help you work with a commercial printer.

Why would you want to do that? A commercial bureau not only can print large quantities far more quickly than an ink jet, but it also can provide much nicer print quality. Until now, these bureaus would accept only documents that were specially prepared for color printing with such high-end programs as Adobe PageMaker or QuarkXPress. With Publisher 2000, you can transfer a project to a Zip disk or other media using a new Pack and Go Wizard, and drop it off at the service bureau. The printer can whip it into shape using Publisher 2000's new Commercial Printing Tools. (Microsoft plans to distribute the program to service bureaus nationwide.)

Other improvements: A Measurement toolbar displays a selected object's size and position, with clickable icons for rotating objects, adjusting text kerning and tracking, and changing line spacing. Publisher's template library now includes 50 new designs for one-page documents and 20 for catalogs and booklets. The program generates automatically bulleted and numbered lists the way Word does. However, it lacks advanced alignment tools, and you can't open more than one document at a time.

Publisher 2000 will cost $99 but will come bundled with the Premium, Professional and Small Business editions of Office 2000. It's worthwhile for anybody wanting to use professional printers without hiring a graphic artist or learning a more complex desktop publishing package.

—Richard Jantz

Microsoft Publisher 2000

PRO: Easy desktop publisher now enables use of commercial printing shops by nonprofessionals.

CON: The printer must use Publisher 2000.

VALUE: Good choice for budget-minded businesses that want to use commercial services for high-quality color printing in quantity.

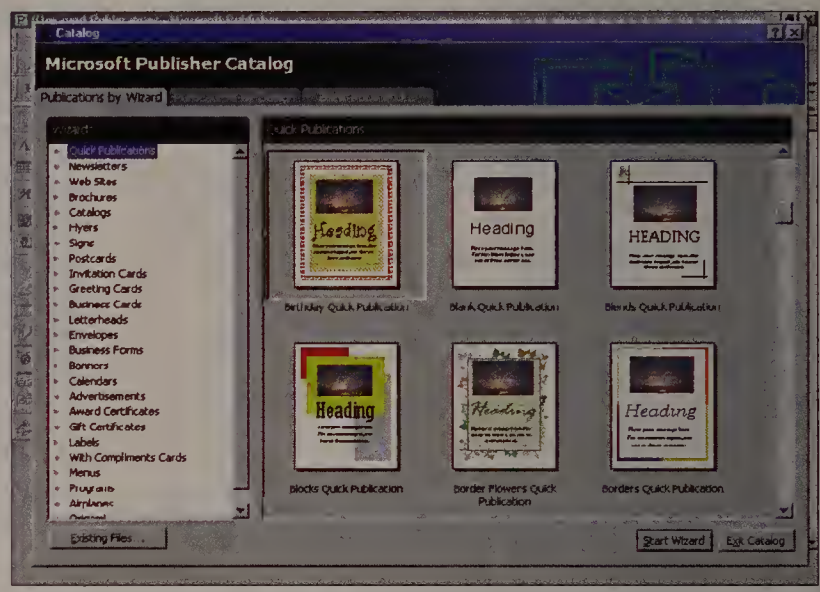
Street price: $99; upgrade$79

Microsoft

800/426-9400

www.microsoft.com/office/

PC WORLD INFONET NO. 731



READY TO GO: PUBLISHER 2000's new Quick Publications templates offer 50 ready-to-roll layouts for one-page projects.

Clean Your Clocks With Norton 2000

YEAR 2000

UTILITIES THAT CHECK to see if your PC is prepared for the much-dreaded year 2000 are a dime a dozen, but why stop there? It's just as important to make sure that your applications and data are secure. I looked at a shipping retail version of Symantec's **Norton 2000,** and found it significantly better than the earlier corporate edition (see "Software to the Rescue," January, www.pcworld.com/jan99/y2ktips), which provided cryptic explanations and missed potential problems.

Norton 2000 not only ensures that your BIOS knows what to do on the fateful New Year's Day, it also scans and analyzes applications and files that might contain time-sensitive data. Problem descriptions are in plain English, and the program can change the short-date format in Windows 95, 98, and NT from 2 to 4 digits. These improvements put Norton 2000 on a par with Greenwich Mean Time USA's Check 2000 PC Deluxe, the best of the Y2K packages that we reviewed in last month's issue.

Norton 2000 can't fix incompatibilities, but it does generate reports with suggestions. It excels at reporting potential problems in individual files, right down to specific cells and lines. It even makes color-coded annotations on spreadsheets.

Norton 2000 works with many popular business applications (Quicken, 1-2-3, FoxPro, Quattro Pro, Paradox, and Microsoft Access, Excel, Word, and PowerPoint). But it has nothing on home-oriented programs such as Quicken Family Lawyer, Quicken Estate Planner, and Calendar Creator. Still, if keeping the data in your files is a priority, Norton 2000 should definitely be on your shopping list.

—Angela Navarrete ▶

Norton 2000

PRO: Easy to use; generates detailed reports on most major business applications.

CON: Doesn't catch errors in some home-oriented programs, including Quicken Family Lawyer.

VALUE: Useful for finding Y2K glitches in hardware and software.

List price: $49

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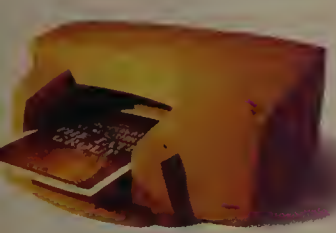
$499



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Featuring PhotoREt Color Layering

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- *Fast, full page color with low operating costs. Networkable option with HP JetDirect Print Server.*

$799

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Featuring PhotoREt Color Layering

- *Designed for workgroups of up to 15 people*
- *3.5 ppm color,* 7 ppm black, both in normal mode*
- *Versatile mid-volume printer. Prints up to 13"x19" and offers a dual paper tray. Networkable via optional HP JetDirect Print Server.*

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- *Designed for workgroups of up to 20 people*
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Cardiff's Soup-to-Nuts Forms Software

FORMS

THE PAPERLESS office remains an elusive dream. Even if *you* create all your business documents using a PC, some coworkers will inevitably rely on paper forms. Cardiff's **Teleform 6** software is the handy link that helps you manage paper forms in a busy computerized environment.

Teleform is a suite of modules that includes Designer, for creating forms; Reader, for translating paper forms into digital data; and Verifier, for correcting data entries. I examined a shipping version.

Think of the Designer module as a desktop publisher that's optimized to create business forms such as surveys, applications, and orders. The paper forms can accept either hand-printed or machine-printed characters and so-called mark-sense fields (blank circles or boxes filled in with marks as appropriate, such as *M* or *F* for gender). You can also easily convert the file for your form into an HTML file for posting on the Web—a time-saver if you need paper and Web forms.

The Reader module interprets scanned and faxed images of completed forms. Optical character recognition is never 100 percent accurate, so Teleform passes the data from the Reader on to the Verifier, which highlights questionable characters. After entering the corrections, you can export the information to databases such as Microsoft Access.

Teleform Standard works with forms you design using the software. The Elite version also captures data from existing forms.

New in version 6 are a form wizard that makes it easier to design forms; more form templates; and a spelling checker. This version is also Y2K compliant, so you'll want it if you plan to use the product in the next century.

Competitor JetForm's similarly priced Design 5.2 offers more design capabilities than Teleform, including greater multilingual support. But JetForm's app is oriented toward electronic forms and doesn't match Teleform's breadth of paper-to-database conversion features.

Teleform, which takes some time to set up and learn, is geared toward businesses that process 100 to 200,000 or more pages of forms per day. If you handle just a couple of dozen forms daily, you're better off sticking with manual data entry.

—*Richard Morochove*

Teleform 6

PRO: Creates and reads paper forms, then links them to computer databases.

CON: Not simple to learn; pricey.

VALUE: Great for offices that process hundreds of forms daily; otherwise, it's overkill.

List price: Standard $1495, Elite $5995

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PC WORLD INFONET NO. 733

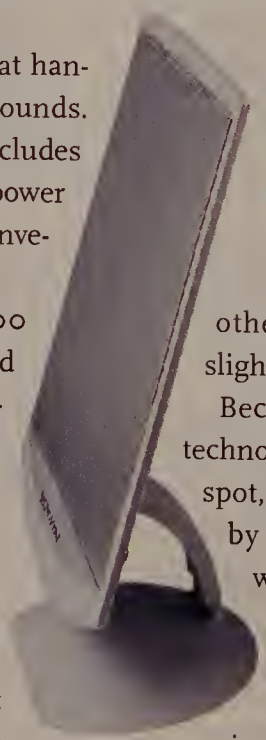
Flat Speakers Give Round Sound

SPEAKERS

NO DOUBT ABOUT IT: Thin is in. Along with flat-panel monitors and slimmed-down notebooks, wafer-thin speakers reflect that dictum.

Despite its name, there's nothing flat about Benwin's $129 **Flat Panel BW2000** speakers, which deliver rich, full 3D sound. I tested a shipping version. Relying on licensed NXT audio technology, which uses complex vibrations in panels instead of the traditional pushed, pistonlike sound of conventional speakers, Benwin's units do not require enclosures to operate. The panels are mounted on sleek, sculpted plastic stands, and plug into a petite (but not flat) desktop subwoofer that handles the deeper bass sounds. The subwoofer also includes the volume, tone, and power controls as well as a convenient headphone jack.

While the BW2000 speakers are designed for use with a computer, they can easily be attached to small stereo systems or radios. In my tests on a PC, I found the sound reproduction to be rich and crisp with excellent channel separation, particularly with popular music from audio CDs and the sound tracks of DVD movies. Classical music and some monaural .wav files, on the other hand, sounded slightly muddy.



AS SLIM AS IT GETS: Benwin's Flat Panel speakers are wafer-thin, but their sound is rich and full.

Because the flat-panel technology lacks a "sweet spot," I felt surrounded by sound no matter where I was in the room. And unlike many computer speakers, these devices come with enough cable to separate them by up to 15 feet, to create a truly panoramic soundscape.

With their attractively slim silhouette, which requires little desk space, and their long cords, which let you place the units out of the way, Benwin's BW2000 speakers are ideal for cramped desktops—and they're reasonably priced. They will also appeal to the computer user who seeks 3D sound but doesn't want to invest in extra speakers.

—*Michael S. Lasky* ■

Benwin Flat Panel BW2000

PRO: Attractive space-saving, paper-thin speakers offer solid sound reproduction.

CON: Classical music and some .wav files sound muddy.

VALUE: Excellent price for innovative PC speakers.

Street price: $129

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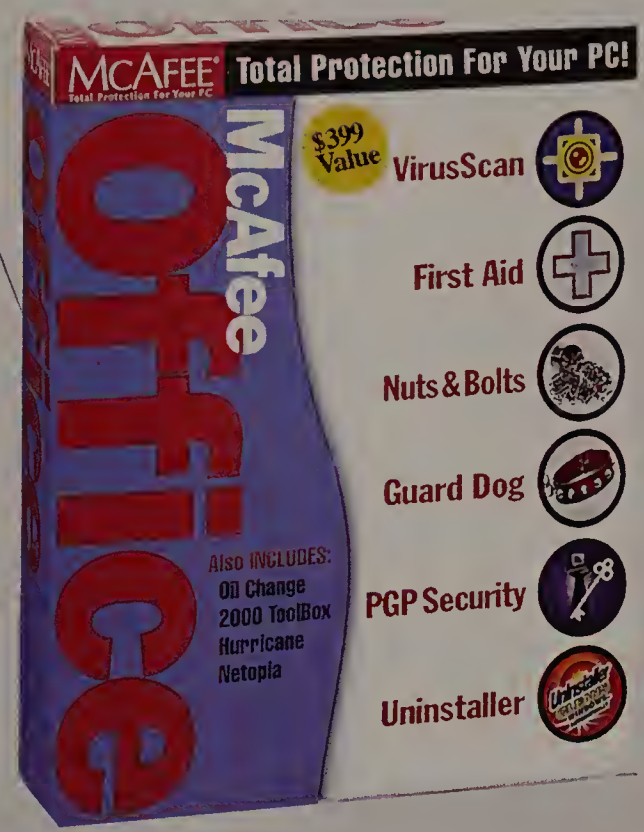

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IT'S NOT YOUR IMAGINATION: Things really *are* changing faster than ever. Take hardware, for example. The average new PC seems to have a shorter life span than a tsetse fly's. Office storage rooms are filled with great technological advances that never made it past version 1.0. As the unlucky souls who purchased them no doubt discovered, the road to PC hell is paved with good inventions.

But to paraphrase a certain software mogul, what about The Road Ahead? Can you avoid buying hardware that becomes obsolete before you've finished paying for it? Yes, you can—if you shop wisely. That's why we've produced this guide to the technologies and trends that will shape the design of PCs for the next three years.

BY MICHAEL DESMOND

Though predicting the future is a job best left to the Psychic Friends Network, it's safe to say you'll see smarter silicon packed into more stylish cases. More than two dozen new CPUs will appear in the next 18 months, along with fast new memory types and data connections. PCs will look better (thanks to slim, affordable LCD screens) and listen better (using software that recognizes speech, gestures, and even eye position).

In fact, by 2001 you may not recognize PCs at all. Many will fit into the palm of your hand; nearly all will offer connections to the Internet and to each other. But the road ahead is also full of speed bumps, potholes, and blind curves. The following pages will help you navigate the hairpin turns of technology and show you what's on the horizon, as well as what's just around the bend. ▶

COVER STORY

More than Intel inside

CHIPS TAKE ON 3D, BUSES HIT 133, FAREWELL AGP?

By 2000, Intel's mainstream desktop CPUs will tick along at a torrid 700 MHz. But that's not the only change you'll find inside the box. The coming three years will see numerous new processor families (see "CPU Road Map," below), a new memory standard, and perhaps an end to the motherboard as we know it. The enhancements will allow new PCs to handle the emerging tasks of the day—intense 3D graphics, full-motion MPEG-2 video, and applications like voice recognition.

The question is, will there be enough of these applications to justify the additional cost? "The amount of processing power that will be in place in systems at that point will be absolutely scary," says Nathan Brookwood, president of Insight64, a technology consultancy in Saratoga, California. "And if software developers don't find a way to soak up all that power, it's going to be a really messy market. The performance available in low-end systems will be far in excess of what most people need for their jobs."

Brookwood adds that it could be years before apps that really tax the coming generation of hardware appear. "I expect that in 2002 we'll see the arrival of reasonable amounts of bandwidth making that last mile to the home and business. And in my mind, that will trigger a reevaluation of what people can do with PCs."

SWIFT SILICON

BROOKWOOD'S concerns haven't slowed Intel's rapid-fire introduction of new processors, nor will it keep the chip giant from making big changes to the PC platform. Later this year we'll see a new type of system memory called Direct Rambus DRAM (RDRAM) start to replace synchronous DRAM (SDRAM). Direct RDRAM memory uses a thin and fast connection to more than double the amount of data available to a PC's processor. MPEG-2 video, Accelerated Graphics Port–enhanced 3D graphics, and high-end imaging applications will all benefit from the faster RAM.

Alas, the performance boost will come at a cost. Brookwood expects both RDRAM chips and compatible motherboards to cost

CPU ROAD MAP WHERE THE CHIPS WILL FALL IN '99 AND BEYOND

YOU think the processor market is crowded now? Just wait. The next 18 months will see more than two dozen new CPUs from industry giants AMD, Cyrix, and Intel, as well as upstarts like Centaur and Rise Technology. These chipmakers will push speeds to a dizzying 700 MHz and beyond. Besides a blizzard of code names and buzzwords, consumers in 1999 will face a real choice: Pay more for performance or opt for cheaper chips that can still handle anything bread-and-butter business apps can throw at them. More buyers may choose the latter.

First out of the gate: 450- and 500-MHz Pentium II chips with Intel's Katmai instruction set, a successor to MMX that incorporates 70 new instructions to accelerate tasks such as 3D graphics and audio processing, speech recognition, and real-time MPEG-2 encoding and decoding. However, as with MMX, software must be optimized to take advantage of this technology. Don't expect such applications to appear overnight.

AMD FIGHTS BACK

AROUND THE SAME TIME, AMD will unveil its 400-MHz Sharptooth chip. Sharptooth may outperform Pentium II chips at equal clock speeds on productivity apps, thanks to an on-board 256KB secondary cache that runs at the CPU's full core speed. (The Pentium II's off-chip secondary cache runs at half the processor's core speed.)

Sharptooth and future AMD chips will also include the 3Dnow instruction set, similar to but not quite as ambitious as Intel's Katmai. 3Dnow is designed to speed up graphics in optimized applications such as games. In the second quarter of this year, AMD will ship its K7 chip, debuting at a speed of 500 MHz or more and supporting a blazing 200-MHz system bus.

Meanwhile, Intel will bump Pentium II Katmai chips up to 533 MHz and introduce the 820 chip set, which will support a 133-MHz system bus. The following quarter, the chip giant will release a new line of Pentium IIs made with a smaller, 18-micron manufacturing process. These so-called Coppermine chips will run at 600 MHz or faster, and come with an on-board 256KB secondary cache that runs at full speed. Supporting chip sets will allow a 133-MHz system bus and memory.

FAST AND CHEAP

BUT IT'S NOT all about power. Expect plenty of action at the low end of the PC spectrum, as AMD, Cyrix, Centaur, and Rise Technology all try to undercut Intel's Celeron chip prices with low-cost processors of their own. The result? Surprisingly powerful desktops for $699 to $999.

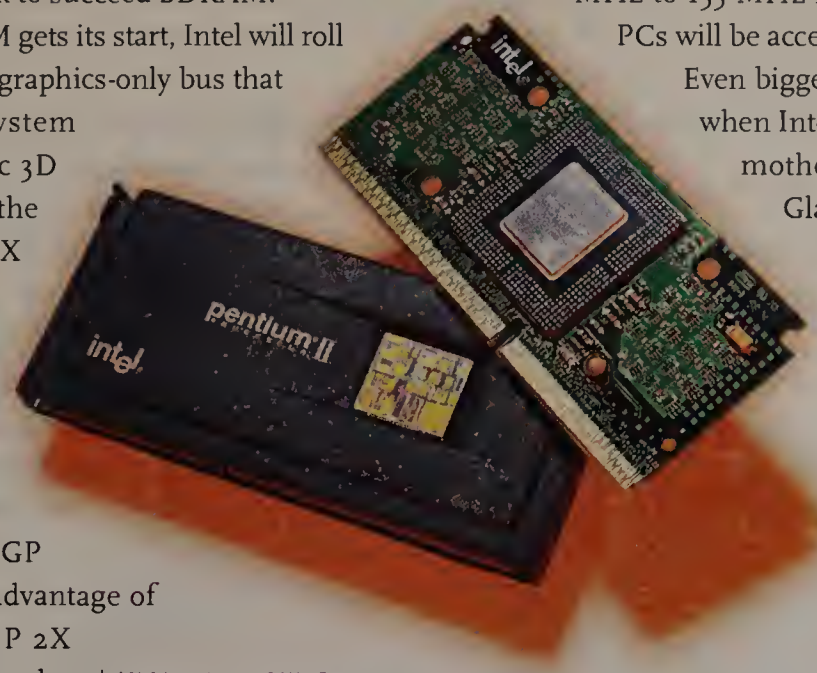
Budget notebooks will also dip under $1000 this year. Intel will release Celeron chips for laptops whose speeds start at 266 MHz; AMD and Cyrix will also ship low-cost notebook chips. But the major notebook news will be Intel's Geyserville technology, which will allow the processor to run at full speed when the machine is plugged in, and at a reduced speed on battery power. Look for Geyserville-driven notebooks to arrive in the third quarter.

As shown in the following pages, real competition—for price *and* speed—is brewing. If nothing else, the race among vendors to give you the most PC power for the money should be fun to watch. Expect glamorous speedsters to come and go, with no one processor lingering in the limelight. Consider this information carefully, whether you're shopping for a $699 bargain or a $2000 barn burner. —Laurianne McLaughlin

more than today's SDRAM technology, at least through 2000. As a result, he says, universal adoption of Direct RDRAM won't happen until 2001. Nonetheless, the technology has the support of key CPU players like Advanced Micro Devices and Compaq's Alpha division, making it a lock to succeed SDRAM.

Around the time that RDRAM gets its start, Intel will roll out a new version of AGP, the graphics-only bus that lets graphics cards call on system RAM to create highly realistic 3D images. AGP 4X will double the data rate of today's AGP 2X cards. The extra speed may help eliminate some delays that occur when AGP-enhanced games juggle detailed 3D scenes. Keep in mind that your mileage may vary.

Even though you'll need an AGP 4X graphics card to take full advantage of the new bus, most older AGP 2X cards should work just fine in the new slots, according to Niles Burbank, product manager for ATI Technologies, a graphics hardware maker based in Thornhill, Ontario.



HIGH AND LOW: Can Intel's Pentium II and Celeron CPUs capture both ends of the PC market?

By late this year, many lower-end machines will not have a separate graphics chip at all, as more tasks begin to fall directly to the chips attached to the processor. Intel's Celeron-based motherboards will begin using the company's forthcoming 810 chip set, which will include a built-in graphics controller. Likewise, Cyrix's MXi processor, which is expected to arrive this spring, will integrate a 3D graphics controller.

MOTHERBOARD MAKEOVER

THIS YEAR, for the second time in two years, Intel processors will boost the bus speed of high-end PCs. Newer chip sets like the one code-named Camino will rev the system bus from 100 MHz to 133 MHz for Pentium II lines, while Celeron PCs will be accelerated from 66 MHz to 100 MHz.

Even bigger changes are due in 2000 or 2001, when Intel is expected to shake up the current motherboard format, according to Peter Glaskowsky, senior analyst for MicroDesign Resources, a technology analysis firm in Sebastopol, California. The change will open the throttles on system bus speeds, further enhancing programs such as real-time natural speech recognition, advanced 3D modeling, and software-based MPEG-2 video playback. (Currently, you need an MPEG add-in card, but the speedier motherboards will handle video without the aid of extra decoder cards.)

Intel won't talk about its plans, but Glaskowsky envisions a motherboard that links components using thin and fast, point-to-point connections. Data will travel directly from system memory to the CPU, bypassing the chip set. The shorter wires and simpler data transfers will allow motherboard speeds of 200 MHz and beyond, says Glaskowsky.

The new type of motherboard will sport a high-end expansion bus that should run nearly ten times faster than today's PCI bus, Glaskowsky adds. This bus will likely supercede AGP and become the main conduit for graphics and even disk access. ▶

FIRST QUARTER 1999

Intel Celeron-366 and -400
Speed: 366 and 400 MHz
For: Budget desktops
What's hot: Near-PII-400 performance in $1499 PCs
What's not: Lacks new Katmai multimedia instructions

Intel Celeron for notebooks
Speed: 266 and 300 MHz
For: Subnotebooks and budget notebooks
What's hot: Low cost; you'll see more $1599-range notebooks soon
What's not: Can't judge battery life yet

Intel Pentium II Katmai
Speed: 450 and 500 MHz
For: Power desktops
What's hot: 70 new CPU instructions for speeding up graphics and audio processing
What's not: Apps must be optimized to take advantage of new instructions

Intel PII-333 and -366 for notebooks
Speed: 333 and 366 MHz
For: Power notebooks
What's hot: On-board secondary cache, could outperform comparable Pentium II desktops
What's not: Could be pricey

AMD Sharptooth
Speed: Likely 400 MHz, perhaps 450 MHz
For: Power desktops first, notebooks later
What's hot: On-board 256KB secondary cache, may surpass comparable Pentium IIs on business apps
What's not: Too early to judge multimedia performance

Cyrix M II-350 and -366
Speed: 350- and 366-MHz PR ratings
For: Budget desktops
What's hot: System prices may be as low as $899 with monitor
What's not: Don't look for great speed on graphics apps like 3D games

Rise Technology MP6
Speed: 233- and 266-MHz PR ratings
For: Budget desktops first, budget notebooks later
What's hot: Claims edge with MMX instructions and soft DVD playback; targeted at $799 to $999 home PCs
What's not: No on-board secondary cache; vendor is a small fish in a sea of CPUs

Note: All dates and chip speeds are approximate, based on projections supplied by vendors and analysts. PR ratings describe the rough performance level of the chips' respective Intel competitors.

The shape of things to come

SHOEBOX PCs, SCREENS GO FLAT, PORTS GET FAT. Your next PC will be speedier, more powerful, and better connected. Despite these improvements, you can expect these PCs to be smaller and less expensive than the one you now own.

The most obvious changes will be cosmetic. The iMac proves that PCs don't need to be boring and beige—but then again, not every Dell or Compaq box will be a translucent art piece either. Changes inside the case will give many systems a more svelte figure, says Carl Everett, senior vice president of the personal systems group at Dell Computer in Round Rock, Texas.

Everett says that by 2000, the archaic ISA expansion bus will be a not-so-fond memory. Freed of bulky ISA slots, vendors will be able to choose from smaller motherboards and experiment with stylish, space-saving PC designs. Miniaturization and market pressure will push the trend, says Martin Reynolds, vice president of technology assessment at Dataquest, a technology research firm in San Jose, California. He expects that by 2002, many desktop PCs will be as small as a shoebox.

GOOD-BYE CRTs: FLAT'S WHERE IT'S AT

THE PC'S SLIMFAST diet will really kick in with the next generation of displays, according to Everett. Today's bulky 17- and 19-inch CRTs can weigh 50 pounds and consume more than a square foot of desk space. LCD screens offer nearly all the display area of today's large CRTs, yet weigh one-fifth as much, take up a third of the space, and use half the electricity. They also display sharper graphics and induce less eyestrain than their CRT counterparts.

Today, a decent 15-inch LCD costs as little as $900—cheap enough to make it an attractive buy for many desktop users. Unfortunately, a surge in flat-panel display sales will outstrip manufacturing capacity in 1999, says Ross Young, president of the research firm DisplaySearch in Austin, Texas. The result is that prices for 15-inch LCDs will drop only slightly—probably to around $825—by the end of the year. Around that time, panel makers will begin to introduce 18-inch models, which will carry premium prices in the $2000 range.

Another problem: The best LCD monitors connect digitally to your PC's graphics card to deliver crisp images. But you may have to wait before all graphics card vendors and LCD makers agree on a standard link. That means your next PC may need to use a proprietary connection to the graphics card.

"What you will see for the next year or so is the graphics cards and the flat-panel monitor will be sold together," says MicroDesign's Glaskowsky. A standard interface should emerge by the end of the year, says DisplaySearch's Young, making buying an LCD as easy as purchasing a CRT monitor today.

The future of displays looks brighter still: IBM Research Labs has demonstrated a flat-panel monitor that produces visual fidelity on par with printed paper. Phil Hester, vice president and chief technology officer for IBM's Personal Systems Group in Somers, New York, says the new technology will enable electronic display of high-resolution images for applications such as medical radiology and aircraft maintenance. "In two to three years, [the price for such a monitor] will drop to the point where you will consider it, but it will still be a premium display," he says.

SECOND QUARTER 1999

Cyrix MXi
Speed: 333- to 350-MHz PR ratings
For: Budget desktops, notebooks
What's hot: Modified M II; first Cyrix chip to implement AMD's 3Dnow instruction set; should handle games well
What's not: Too early to judge

Cyrix M II-400
Speed: 400-MHz PR rating
For: Budget desktops
What's hot: Low system prices, reasonable business application speed
What's not: Graphics speed is still an unknown

Intel PII-533 Katmai
Speed: 533 MHz or faster
For: Power desktops
What's hot: New 820 chip set supports 133-MHz system bus and memory
What's not: AMD's K7 processor may be faster on some business apps

AMD K7
Speed: 500 MHz or more
For: Power desktops, workstations, servers
What's hot: Seventh-generation chip core, improved floating point capabilities, support for a 200-MHz system bus
What's not: Too early to tell

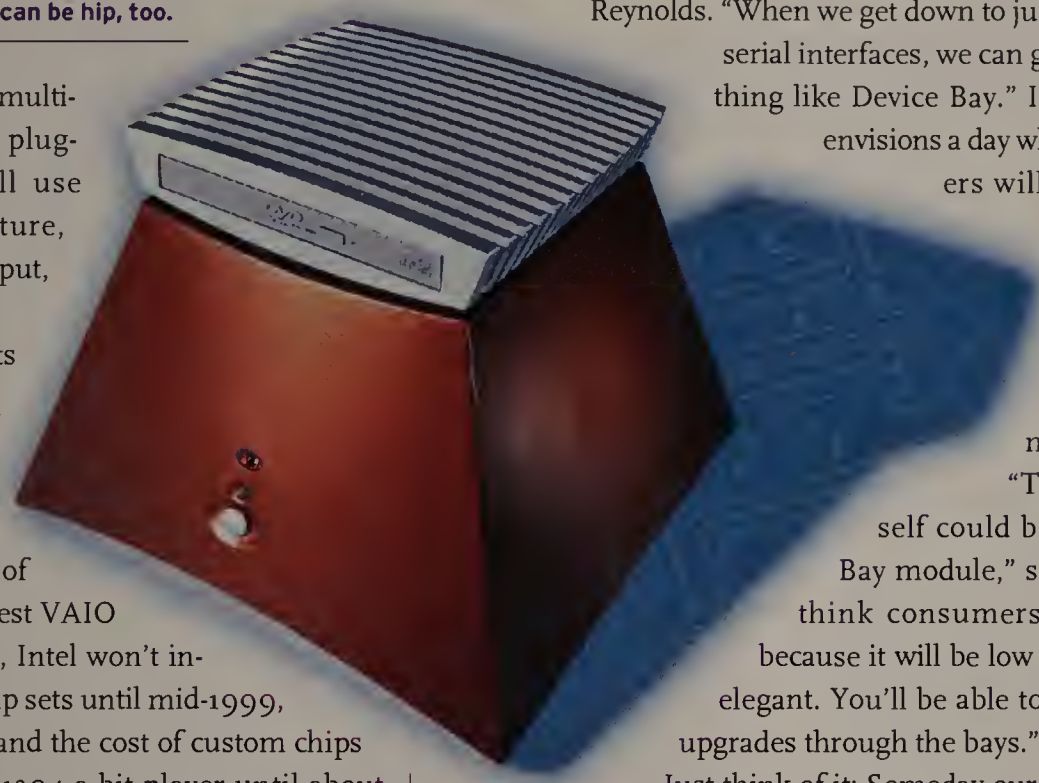
Rise Technology MP6 II
Speed: Likely 333- or 366-MHz PR rating
For: Budget desktops first, budget notebooks later
What's hot: On-board 256KB secondary cache should speed up CPU significantly over original MP6
What's not: Unclear how well newcomer will fare against AMD, Cyrix, and Intel

Centaur WinChip 2A
Speed: 233, 250, and 266 MHz
For: Budget desktops
What's hot: Superlow prices, 100-MHz system bus
What's not: Has 64KB primary cache, but no secondary cache; effect on performance is unknown

PARING DOWN PORTS

YOUR NEXT PC will drop ports as well as pounds—and the ports that remain will run faster and act smarter than the ones they replace. Expect all new computers to ship with USB-compliant mice, keyboards, and other peripherals. Native support in Windows 2000 (aka NT 5) will also bring USB's benefits to many corporate and high-end PC users.

USB will have some company in the form of the IEEE 1394 bus, better known as FireWire. This ultrafast serial bus runs up to 100 times faster than USB, yet allows you to link multiple peripherals in a convenient, plug-and-play daisy chain. You will use FireWire for digital video capture, broadcast-quality digital video output, and high-speed disk drives.



MOVE OVER, iMAC: With its Concept PC prototype, Intel hopes to prove that PCs can be hip, too.

In fact, the IEEE 1394 bus exists today: Both Sony and Compaq now ship consumer-oriented desktop computers with ports that support the bus. Sony has even added its own version of FireWire, called I.Link, to its newest VAIO PCG-505FX notebooks. However, Intel won't include support for the bus in its chip sets until mid-1999, says MicroDesign's Glaskowsky, and the cost of custom chips and connectors will make IEEE 1394 a bit player until about 2001. At that point, the new specification will replace both SCSI and IDE as the bus of choice for mass storage devices like hard disks and CD-ROM drives.

In the meantime, expect your next desktop PC to sport an updated IDE interface for internal drives. The ATA-66 interface—introduced by Quantum Technology to buy time until FireWire catches on—doubles the peak performance of current ATA-33 peripherals. But don't rush out just yet to get a new ATA-66–friendly PC and compatible drives; today's ATA-33 storage devices provide enough performance for all but the most demanding applications.

USB and FireWire also set the stage for a standard called Device Bay, a modular, tool-free housing for plug-and-play peripherals. Need to work on that big 500MB presentation over the weekend? Just slide out your office PC's hard disk, as you would a removable car radio, and pop it into your home machine.

"I think that three years out we'll start to see a fairly significant penetration of Device Bay with IEEE 1394," says Dataquest's Reynolds. "When we get down to just a couple of fast serial interfaces, we can get by with something like Device Bay." In fact, Reynolds envisions a day when system makers will turn to Device Bay technology as a way to cut the considerable costs of motherboard manufacturing. "The processor itself could become a Device Bay module," says Reynolds. "I think consumers will take to it because it will be low priced and quite elegant. You'll be able to do many of the upgrades through the bays."

Just think of it: Someday our PC components will be simple, slide-in modules. No ribbon cables, no tiny screws. We may never have to take the cover off a PC again.

INSTINCTIVE INPUT

CRITICAL ADVANCES in computer recognition of speech, facial characteristics, and gestures will add new dimensions to PC interfaces. Monitor-top cameras and superfast hardware will enable the "multimodal interface," says Robert Morris, direc- ▶

THIRD QUARTER 1999

Intel Pentium II Coppermine
Speed: 600 MHz or faster
For: Power desktops and notebooks
What's hot: New manufacturing process allows higher clock speeds and on-board 256KB secondary cache, a first for Pentium II desktop chips. Geyserville technology lets notebooks run at 600 MHz when plugged in or at 400 MHz on battery
What's not: You'll probably pay premium prices

Cyrix Media PC integrated chip
Speed: 233 to 300 MHz
For: Sub-$500 information appliances
What's hot: Could enable new class of low-cost devices for the home
What's not: Chip may ship late

Centaur WinChip 3
Speed: 200, 233, and 266 MHz
For: Budget notebooks
What's hot: Low-power chip with an unusual 128KB primary cache and a 100-MHz system bus
What's not: No on-board secondary cache; too early to judge potential on-board performance

Cyrix Jedi
Speed: 400- to 450-MHz PR ratings
For: Budget desktops
What's hot: Improved floating point and MMX support compared to other M II chips; has AMD's 3Dnow instruction set; cheaper than Celeron-based PCs
What's not: Too early to judge performance

tor of personal systems and advanced systems technology for IBM Research in Yorktown Heights, New York. "We are trying to bring the keyboard, the pen, the camera, and speech all together," he says. "There will be interfaces that observe you and track your eye position. One thing we're experimenting with at the moment is how to use cameras in children's educational games." Future multimedia titles will be able to detect whether children are paying attention to the game and then respond appropriately.

Users with disabilities will also benefit from interfaces that can recognize gestures. Smart software will allow PCs to separate normal human movement from command-specific gestures, says Morris.

Similarly, input devices will become more intelligent and more interactive. "We're definitely exploring what a mouse can do," states Dan Coyne, group marketing manager for Microsoft's Hardware Group. Coyne describes a mouse in development that lets users feel icons and links as the device is dragged over them.

As usual, gamers will get first crack at most of these new technologies. Microsoft's new Freestyle Pro game pad introduces motion detection to the mix. "When the game pad is tipped, it actually detects the movement," says Coyne. "So when you tip your controller to the right, the motorcycle actually turns to the right. As you instinctively move, it moves too."

NOTEBOOKS THIN IS IN

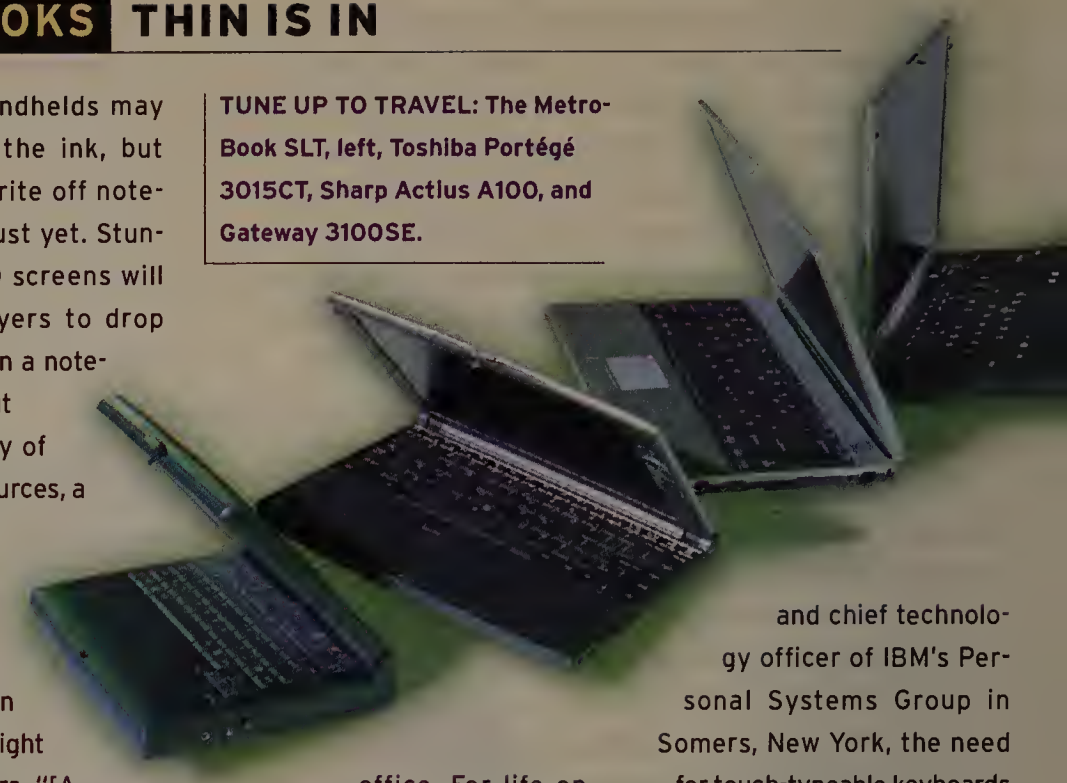
SEXY handhelds may get all the ink, but don't write off notebooks just yet. Stunning 15-inch LCD screens will entice many buyers to drop $4000 or more on a notebook computer. But Peter Glaskowsky of MicroDesign Resources, a technology analysis firm based in Sebastopol, California, says such large-screen notes push the weight limit for most users. "[A 15-inch LCD] is physically too big for notebooks," he says. "The screens have to stay around 13 or 14 inches to give the notebook a manageable size and weight."

The 15-inch screen will find a home on desktop replacements—feature-laden notebooks that spend most of their time in the office. For life on the road, buyers may opt for slick 3- and 4-pound portables such as Sony's magnesium-alloy coated VAIO PCG-505FX or Sharp's sleek, black, and brushed silver Actius. By year's end, 400-MHz Pentium II CPUs for portables with Katmai instructions will debut, while DVD-ROM and 100-MB floppy drives will become standard equipment.

But even though "thin is in," says Phil Hester, vice president and chief technology officer of IBM's Personal Systems Group in Somers, New York, the need for touch-typeable keyboards limits how much notes can shrink.

And don't expect big changes in battery life, warns Glaskowsky. Small gains will come from smart operating systems that turn off PC subsystems when idle.

Finally, Intel's Geyserville technology should enable processors to run at higher clock rates when notebooks are plugged in, allowing them to reach speeds that were once the sole province of desktop systems.



TUNE UP TO TRAVEL: The MetroBook SLT, left, Toshiba Portégé 3015CT, Sharp Actius A100, and Gateway 3100SE.

WHAT'S IN STORAGE?

ABOUT TEN YEARS AGO, you could buy a PC with a 100MB hard disk and a 1.44MB floppy drive. These days you can buy a computer with a 16GB hard disk and—you guessed it—a 1.44MB floppy drive. How has the floppy survived? ▶

FOURTH QUARTER 1999

Intel Celeron-450
Speed: 450 MHz
For: Budget desktops
What's hot: Loaded systems at low prices
What's not: Too early to tell

Intel PII-650 or PII-700 Coppermine
Speed: 650 or 700 MHz
For: Power desktops
What's hot: Too early to tell
What's not: Existing software doesn't need this much speed

Centaur WinChip 4
Speed: 400 to 450 MHz
For: Budget desktops and notebooks
What's hot: New chip core uses a 128KB primary cache and 100-MHz system bus
What's not: Too early to tell

Cyrix MXi-400
Speed: 400-MHz PR Rating
For: Budget desktops, notebooks
What's hot: Integrated 3D graphics; likely choice for extremely low-cost home PCs
What's not: Too early to judge

Cyrix Jedi-500
Speed: 500-MHz PR Rating
For: Budget desktops
What's hot: May offer better graphics support for games than Intel's Celeron at this time
What's not: Probably won't outperform 450-MHz Celerons by much on business applications

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It's not for lack of alternatives. The Iomega Zip, LS-120 SuperDisk, and Syquest EZ Flyer drives have all tried and failed to replace the unsinkable floppy. Now Sony is pushing a 200MB floppy called HiFD, which is readable by new external and internal drives. "It's chaos," says Hester of IBM's Personal Systems Group. "The problem is that there are a whole bunch of very good disk storage technologies, many of which have reasonable market share. I think it's going to be something of a potpourri for quite a while."

According to Dataquest's Reynolds, CD-Rewritable is the most likely universal format, at least for the short term. CD-RW drives now sell for less than $350 and will continue to drop in price, and nearly all PCs sold in the past two years can read CD-RW media. "My view is that eventually we'll see a DVD-ROM drive that's capable of recording CDs," says Reynolds.

One thing we definitely won't have to worry about is a storage crunch. IBM's Hester says the data capacity of magnetic hard disks will continue to grow at its current torrid pace. By 2000 we'll see 50GB hard drives; by 2001 that number should increase to 75GB or 100GB.

FLAT-OUT GORGEOUS: Silicon Graphics' 17-inch LCD looks great, but it requires a custom graphics card.

Making the right connections

CABLE HOOKS UP, WEB APPS LOG ON, NET PHONES DIAL IN.

Yes, more and more users will retire their creaky analog modems in favor of fast cable modems and DSL (Digital Subscriber Line) devices. But the truth is, high-speed Net access will remain unavailable to most homes.

Even so, we'll all be doing more work online—from real-time banking and collaborative office apps to Web-based personal information managers and schedulers. And Internet phone service may finally become something to talk about.

For most users, the biggest issue is how they will connect to the Internet in 2000 and beyond. Unfortunately, most homes and small businesses will rely on the same old phone lines and modems they use today. According to a study by Jupiter Communications, a New York–based Internet market research firm, only one home in five will have high-speed Net access by 2002. If you're among that lucky few, odds are you'll be using a cable modem. Over 60 percent of homes in the United States currently subscribe to cable TV service, and Internet access via cable can be had in a growing number of metropolitan areas for as little as $40 per month. But many providers haven't yet upgraded their coaxial cable lines for two-way data communications or added new equipment to serve individual neighborhoods. ▶

2000 AND BEYOND

Intel Celeron-500
Speed: 500 MHz, possibly 600 MHz
For: Budget desktops
What's hot: Likely to include Katmai instructions
What's not: Too early to tell

Intel PII-700
Speed: 700 MHz or faster
For: Power desktops
What's hot: Too early to tell
What's not: Few apps may require this much speed

Intel Willamette
Speed: 1 GHz or faster
For: Power desktops
What's hot: Completely new, seventh-generation chip core replaces Pentium II and Celeron chips
What's not: Intel's schedule could slip into 2001

Intel Merced
Speed: Up to 800 MHz
For: Multiple-processor systems
What's hot: First chip to use 64-bit architecture; aimed at servers and workstations
What's not: Applications need to be recompiled for 64-bit computing

Cyrix Jalapeno (M3)
Speed: 600 to 800 MHz
For: Budget desktops and notebooks
What's hot: New chip core replaces the M II; will use integrated 3D graphics unit
What's not: Too early to tell

Centaur WinChip 2000
Speed: 500 MHz or faster
For: Budget desktops and notebooks
What's hot: If Centaur delivers chip on time, it can stay in the game competitively
What's not: Too early to tell

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PC World Cover Story: Special Report on Reliability and Service— November 1998 — Good Rating, 4 Stars out of 5 for Overall Reliability and Service

PC World Best Buy
Best Buy #2
Top 20 Budget Desktops
November 1998

PC World
Best Buy #1
Top 10 Home PCs
November 1998

***PC World* 1998 Reliability & Service Survey:**

	Overall reliability score	Overall service score
Good		
CyberMax	★★★★	★★★★
Dell	★★★★★	★★★
IBM	★★★★	★★★
Fair		
Gateway 2000	★★★	★★★★
Compaq	★★★	★★★

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In contrast, the other heralded high-speed network option—DSL technology, championed by phone companies—is expected to languish in the home market. "The [regional] Bell operating companies are trying not to cannibalize their T1 services, which are incredibly lucrative," says Zia Daniell, an analyst in the telco and cable Internet strategies group at Jupiter Communications. Businesses today pay as much as $1000 a month to lease a T1 line. Low-cost DSL services promise to deliver nearly equivalent performance for as little as $40 a month.

Users in rural areas will rely on satellite services such as DirecPC for speedy Internet downloads, though uploads still require a slow modem connection. The picture gets brighter in 2003, when Teledesic launches the last of some 288 low-earth-orbit satellites; the low orbit allows upstream data to be sent directly to the satellite, resulting in cablelike data rates.

CABLE READY: Com21's cable modem offers speedy Web surfing—provided your cable company supports it.

INTERNET EVERYWHERE

THIS YEAR, LOOK for more Internet services to replace apps that traditionally reside on a local network or desktop. Companies like Telecomputing ASA in Norway are rolling out "rent an app" services, using Microsoft's Windows NT Terminal Server to dispense Windows programs to terminals worldwide. All that passes between the server and the client system are screen updates and keystrokes. Think of it as outsourcing IS: Small firms pay a low monthly fee to a provider, which manages the apps and servers.

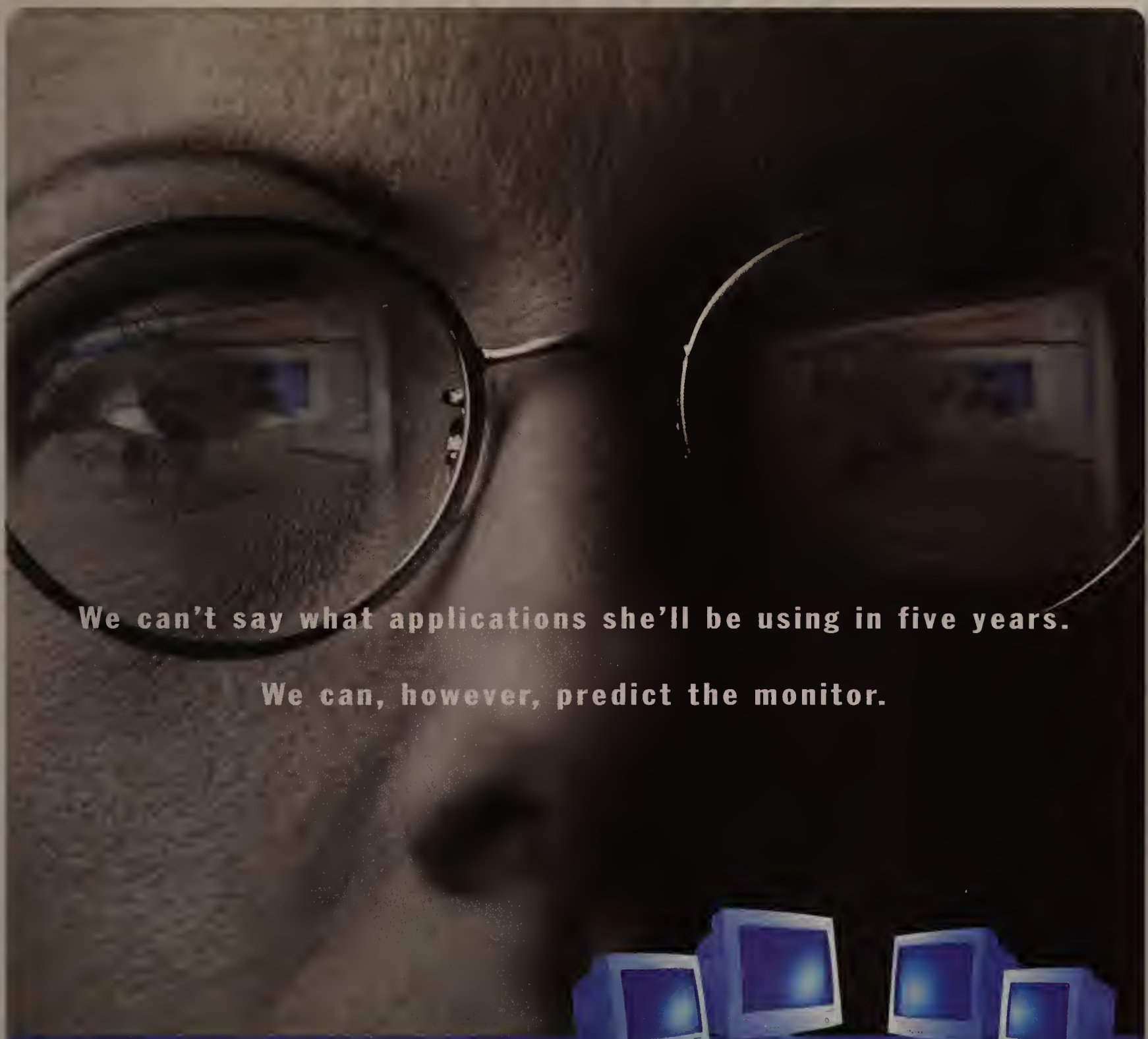
Meanwhile, Web-based services let individuals and groups post and share their schedules online. AT&T's PocketNet, for example, lets you upload data to the Web and then access it with a cellular phone. Pacifica Software's Web Calendar and Yahoo Calendar give you access to your Web-based schedules.

Applications will also become more Web savvy. Take Microsoft's Office 2000 suite: It offers HTML as a native file format; after you save a Word 2000 document to the corporate intranet, you can open the HTML file directly in Word to make changes.

Even your phone will go online, as telephone companies begin to deliver reliable, low-cost voice–over–Internet Protocol services. Once derided for its poor audio quality and lack of coverage, IP telephony is improving and expanding. More importantly, you no longer need a PC to make IP calls—you can dial a toll-free number, punch in your personal identification number, and then dial. Jupiter's Daniell says that consumers and small businesses will be the first to take advantage of Net phone services' lower rates. ▶

FUTURE TECHNOLOGY COMING SOON TO A PC NEAR YOU

DEVELOPMENT	The buzz	But on the other hand...
First quarter 1999		
$900 15-inch LCD screens	Great-looking images.	No standard digital interface; cost more than 17-inch CRTs.
ATA-66 IDE hard drives	Double the speed of existing IDE drives.	Could be speed you don't need.
HiFD removable storage devices	Sony's fast, 200MB floppy replacement could be the real deal.	Just what we need—another floppy technology.
Katmai CPU instructions	3D graphics, audio, and speech recognition get a boost.	Show me the software.
Palm III meets the cell phone	A natural marriage of convenience.	Price will be hefty.
Second quarter 1999		
340MB MicroDrive hard disk	IBM's PC-Card-like disk for notes and PDAs may replace flash RAM.	Will we add hard disk crashes to our list of PDA worries?
Faster motherboards	Intel pushes motherboards to 133 MHz.	You'll need expensive RDRAM to use these.
First ISA-free machines	Fewer hardware hassles.	Kiss your old sound cards and modems good-bye.
Third quarter 1999		
810 chip set	Intel's built-in 2D and 3D graphics for low-cost systems.	Two words: no upgrades.
AGP 4X graphics	Doubled-up AGP bus readies hardware for future graphics.	For gamers only—if they can find the software.
Direct RDRAM memory	Terrific 3D graphics performance.	We're back to the days of pricey RAM.
600-MHz Pentium II	Integrated 256KB secondary cache means this chip will fly.	Can you afford the ticket?
Fourth quarter 1999		
Standard interface for LCDs	Plug and play, take it away.	Panel shortage will keep prices high.
Windows 2000 (aka Windows NT 5)	Fewer crashes, better security, corporate-minded features.	Promises, promises.
First quarter 2000		
First Bluetooth devices	Fast wireless link for PCs and devices.	Sure to be supported in, oh, Windows 2010?
ISA-equipped machines begin to disappear	Ding dong, the witch is dead.	And so are all your trusty ISA peripherals.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COVER STORY

The incredible shrinking computer

SUBNOTES EMERGE, CELL PHONES AND HANDHELDS CONVERGE. PalmPilot users display a cultish affection for their little handheld devices. Expect similar love affairs to bloom over the next two years, as cell phones, beepers, and personal digital assistants merge to form powerful communications tools.

But don't count out Jupiter machines yet. These small portable devices, which use the Windows CE Professional operating system, weigh about 2 pounds, provide 9-inch color screens, and offer keyboards that are large enough to type on. At prices less than $1000, according to Dataquest's Reynolds, these machines plug a gap between tiny handhelds and full-featured notebook computers that cost twice as much. Hewlett-Packard, NEC, Samsung, and Sharp all market Jupiter devices (as they are code named) to traveling executives tired of hauling around an 8-pound notebook just to check their e-mail messages. CE Pro machines offer instant-on operation and quick data retrieval, making them suitable for a wide range of applications.

PILOT LOVERS will flip for QualComm's combination cell phone and Palm III device.

HAND IN HAND

EXPECT TO SEE lighter, more powerful handheld devices equipped with sharper screens this year. For example, 3Com's next version of the Palm will reportedly offer a color screen in a case that is only one-third the thickness of its predecessors.

Cellular phones and personal digital assistants will also be getting cozy. QualComm's PdQ Smartphone, expected by the middle of the year, will combine a 3Com Palm III and a QualComm digital cellular phone. You'll be able to grab e-mail over the phone and dial directly from the Palm III address book.

The real breakthrough, however, may come in late 1999 to early 2000, when devices start using a wireless technology called Bluetooth. This industry standard will enable fast short-range communications between devices. Set your Bluetooth-capable palmtop device next to a similarly equipped PC, and they'll transfer e-mail and update contact lists at about 1 megabit per second.

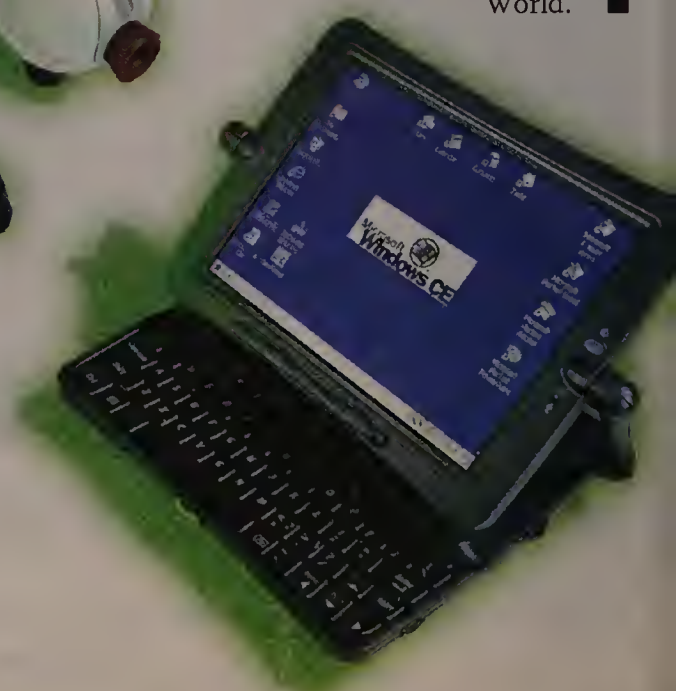
American Airlines and other airlines are talking about installing Bluetooth stations in airport lounges, so fliers can place their notebooks next to a transmitter and check their e-mail.

Lee Green, director of corporate identity and design at IBM, envisions bigger changes: "At some point in the future, one version of a mobile device will be a wearable one." According to Green, everyone from surgeons to archaeologists will be able to access critical information using such a PC. A tiny monitor mounted over one eye could display text and schematics, while navigation could be handled through voice recognition. Fairfax, Virginia–based Xybernaut is already marketing a wearable PC featuring a 233-MHz processor, 128MB of RAM, and a 4.3GB hard drive. You attach the 28-ounce processor unit to your belt; an optional keyboard can be strapped to your arm. The price? A fashionable $5700.

Ultimately, new classes of portable devices will permeate our homes and workplaces, says Phylis Porio, IBM's director of marketing for pervasive computing. "[The lines between] people's business lives and personal lives are blurring more and more."

In areas such as entertainment, the lines may already be permanently blurred. Diamond's controversial RIO MP3 audio device plays back high-quality compressed music files that can be downloaded from the Internet. Recording companies, fearful that illicit downloads of commercially-available music will find a ready market in the MP3 platform, have tried to block the technology from getting to consumers. But digital content of all kinds will take similar paths to reach consumers in the coming years.

Michael Desmond is a consultant and author of the Peter Norton Guide to Upgrading and Repairing PCs *(Sams Publishing, 1997). Laurianne McLaughlin is a senior associate editor for* PC World. ■



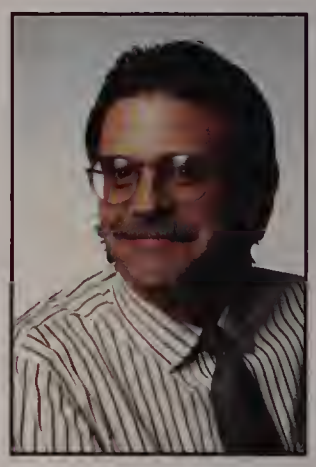
SMALL AND SMART (clockwise from top): Sony's I.Link digital camera, Philips' USB-based video camera, Vadem's Clio CE machine, and Diamond's RIO MP3 player.

Why choose Quantex?

intel inside
pentium® II PROCESSOR

The experts do

"When we replaced our Compaq systems in 1995 with Quantex systems for our executive departments, we not only got fast, powerful, nearly maintenance-free machines, but also dramatically reduced our total cost of ownership. On those rare occasions when we have a service need, the responsiveness of the Quantex staff is incredible. For a business like ours that depends on the uninterrupted flow of information to our customers, Quantex systems deliver everything we expected, and more, at an excellent value."



James Senecal, LAN Specialist, Pacific Life Insurance, Newport Beach, CA.

THE MORE YOU KNOW, THE BETTER QUANTEX GETS.

Quantex's excellent reputation among industry experts and experienced buyers grows stronger by the day. Time after time, the industry's top product reviewers have awarded our systems top honors including "Editors' Choice" and "Best Buy" awards. But when it comes to really knowing what we're about, it's business buyers—like you—who are the real experts. After researching, comparing, and buying Quantex systems, they understand exactly what's reflected in our awards and high industry scores for satisfaction and quality of technical support. In short, they've experienced the satisfaction of owning a Quantex.

Still, there are people who don't know that we're one of the world's largest direct marketers of computer systems. After all, it takes time for perception to catch up to reality. So, we'd like to encourage everyone else to get to know us. The sooner the better.

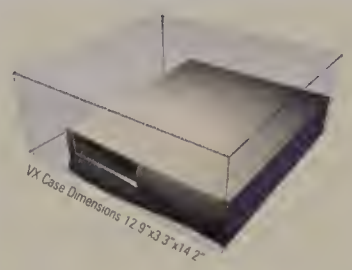
all the time.

" Who says business systems have to look boring?
You'll be the envy of the office with the
stylishly curvaceous [Quantex] Slimline next to you."

c|net Comdex '98 Coverage

INTRODUCING A SMALL AND STYLISH REVOLUTION IN BUSINESS DESKTOP DESIGN—ONLY FROM QUANTEX.

Without sacrificing speed or performance, Quantex VX-Series Slimline PCs pack plenty of raw power and easy, built-in manageability into a small, elegant form factor. Up to 70% smaller than many standard desktops, this full-featured design is configured specifically for businesses and large corporations. Plus, our innovative QSentry technology and advanced network management features come integrated for greater system and network security.



Using up to 70% less desk space than standard desktops, the Quantex VX-Series will do wonders for all business environments.

INTRODUCING!

Quantex VX-400c $999

Business lease: $35/Mo. **Order Code #pcw0273**

- Intel® Celeron™ Processor 400MHz
- 32MB SDRAM Memory / 128KB Secondary Cache
- 4.3GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 15" Digital Monitor (13.8" viewable)
- Intel740 3D 2X AGP Graphics with 8MB SDRAM
- *New* Intel Pro 10/100 PCI Fast Ethernet Controller with RJ-45 and Wake-On-LAN Technology
- 32X Max Variable Speed CD-ROM Drive
- ESS Solo Wavetable Sound Card
- Quantex Slimline Case (12.9"x3.3"x14.2")
- 104-Key Keyboard with MS Mouse
- MS Windows 98
- QSentry Technology (Including Intel LANDesk Client Manager V.3.1)

Quantex VX-400 $1499 Order Code #pcw0274

Above system with Pentium® II processor 400MHz, 128MB SDRAM, 10.2GB Ultra-ATA HD, and 17" Digital Monitor (15.8" viewable).

INTRODUCING!

Quantex VX-400 $1999

Business lease: $70/Mo. **Order Code #pcw0275**

- Intel® Pentium® II processor 400MHz
- 64MB SDRAM Memory / 512KB Secondary Cache
- 10.2GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- Quantex 15" LCD Flat-Panel Display
- Intel740 3D 2X AGP Graphics with 8MB SDRAM
- *New* Intel Pro 10/100 PCI Fast Ethernet Controller with RJ-45 and Wake-On-LAN Technology
- 32X Max Variable Speed CD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Quantex Slimline Case (12.9"x3.3"x14.2")
- MS Natural Keyboard Elite with MS Mouse
- MS Windows 98
- QSentry Technology (Including Intel LANDesk Client Manager V3.1)
- *Upgrade to Windows NT 4.0, add $99*

Quantex 15" LCD Flat-Panel

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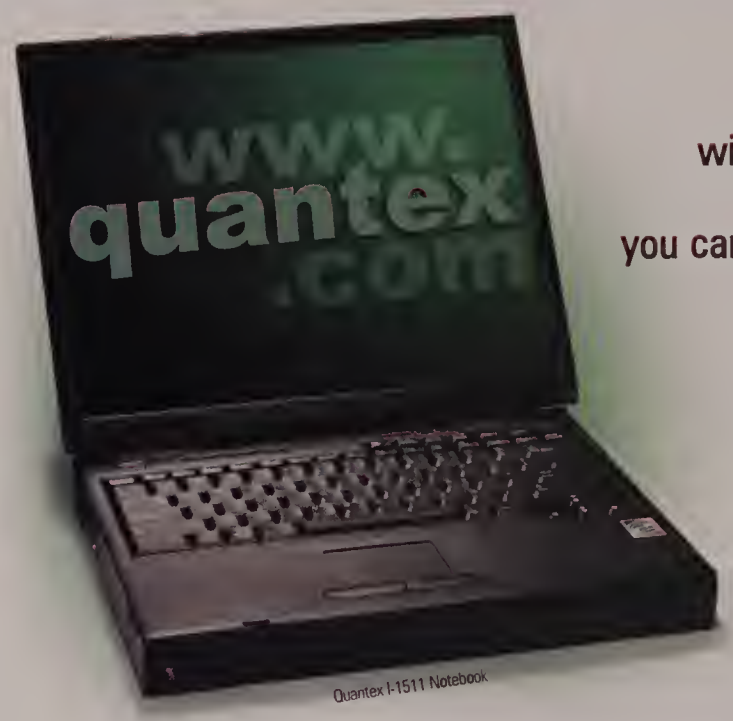

Quantex I-1511 Notebook

"A great buy for professionals who want a wide-screen notebook with very good performance... you can easily deploy the Quantex as a desktop replacement."

WINLIST Award Windows Magazine (Oct. 98)

Introducing the Quantex I-1511 Notebook—complete with a "XX-Large" 15" Active Matrix Display, powerful 96MB of SDRAM, massive 8GB hard drive, sharp ATI 3D AGP Video w/8MB and a built-in 56K V.90 fax/modem—for the incredible price of just $2899.

IF YOUR LAPTOP SAYS WHO YOU ARE, THE I-SERIES SAYS YOU'RE EXTREMELY POWERFUL

If you demand nothing less for yourself than all the convenience and flexibility of a laptop along with all the enterprise-shaking power of a mega desktop, you'll want to get to know the Quantex I series notebooks. They give you the fastest and most powerful Pentium® II processors, long lasting 12-cell lithium Ion batteries, and built-in dual drive bays for simultaneous use of floppy and DVD- or CD-ROM. You also get stunning Active Matrix displays up to 15", and ATI AGP 3D graphics accelerators—all the juice you need to flex your multimedia muscle. You get the idea. Everything you need to know about portable computing power is right on this page.

Big On Screen. Small On Price. Quantex I-Series notebooks are now available with "XX-Large" 15" displays. Check them out starting at just $2499.

I-SERIES NOTEBOOKS

Quantex I-1410 $2199

Business lease: $77/Mo. Order Code #pcw0258

- Pentium® II processor 266MHz
- 14.1" XGA Active Matrix Display
- 64MB SDRAM
- 4GB Ultra-ATA HD
- 56K V.90 Fax/Modem
- Removable Combo 24X CD-ROM Drive & 3.5" Floppy Drive
- *New* ATI Rage Lt Pro 3D AGP Video w/8MB
- *New* ESS 3D Wavetable Surround Sound and Speakers
- *New* Long-Lasting 12-Cell Smart Lithium Ion Battery
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98
- Microsoft Office 97 SBE v2.0
- Quantex Carrying Case
- Year 2000 Compliant
- 3-year limited warranty on CPU and Main Memory
- 1-Year parts and labor warranty on all other components
- *Upgrade from 64MB SDRAM to 128MB SDRAM, add $149*
- *Upgrade from 4GB Ultra-ATA HD to 6GB Ultra-ATA HD, add $129*

INTRODUCING!

Quantex I-1510 $2499

Business lease: $88/Mo. Order Code #pcw0260

- Pentium® II processor 266MHz
- 15" XGA Active Matrix Display
- 64MB SDRAM
- 6GB Ultra-ATA HD
- 56K V.90 Fax/Modem
- Removable Combo 2X DVD-ROM Drive & 3.5" Floppy Drive
- *New* ATI Rage Lt Pro 3D AGP Video w/8MB
- *New* ESS 3D Wavetable Surround Sound and Speakers
- *New* Long-Lasting 12-Cell Smart Lithium Ion Battery
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98
- Microsoft Office 97 SBE v2.0
- Quantex Carrying Case
- Year 2000 Compliant
- 3-year limited warranty on CPU and Main Memory
- 1-Year parts and labor warranty on all other components
- *Upgrade from 64MB SDRAM to 128MB SDRAM, add $149*
- *Upgrade from 6GB Ultra-ATA HD to 8GB Ultra-ATA HD, add $199*

Quantex I-1411 $2699

Business lease: $94/Mo. Order Code #pcw0259

- Pentium® II processor 300MHz
- 14.1" XGA Active Matrix Display
- 12BMB SDRAM
- 6GB Ultra-ATA HD
- 56K V.90 Fax/Modem
- Removable Combo 2X DVD-ROM Drive & 3.5" Floppy Drive
- *New* ATI Rage Lt Pro 3D AGP Video w/8MB
- *New* ESS 3D Wavetable Surround Sound and Speakers
- *New* Long-Lasting 12-Cell Smart Lithium Ion Battery
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98
- Microsoft Office 97 SBE v2.0
- Quantex Carrying Case
- Year 2000 Compliant
- 3-year limited warranty on CPU and Main Memory
- 1-Year parts and labor warranty on all other components
- *Upgrade from 6GB Ultra-ATA HD to 8GB Ultra-ATA HD, add $199*

INTRODUCING!

Quantex I-1511 $2899

Business lease: $101/Mo. Order Code #pcw0261

- Pentium® II processor 300MHz
- 15" XGA Active Matrix Display
- 96MB SDRAM
- 8GB Ultra-ATA HD
- 56K V.90 Fax/Modem
- Removable Combo 2X DVD-ROM Drive & 3.5" Floppy Drive
- *New* ATI Rage Lt Pro 3D AGP Video w/8MB
- *New* ESS 3D Wavetable Surround Sound and Speakers
- *New* Long-Lasting 12-Cell Smart Lithium Ion Battery
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98
- Microsoft Office 97 SBE v2.0
- Quantex Carrying Case
- Year 2000 Compliant
- 3-year limited warranty on CPU and Main Memory
- 1-Year parts and labor warranty on all other components
- *Upgrade from 96MB SDRAM to 128MB SDRAM, add $99*

I-Series Upgrade Options: ■ *Quantex Mini-Docking Station...add $149* ■ *12-Cell Long-Lasting Lithium Ion Battery...add $149* ■ *PCMCIA Network Interface Card.. .add $129* ■ *Quantex Deluxe Carrying Case...add*

know, know.

"The Quantex QP6/SB-4 is a sturdy, practical machine. Designed for the business user...it comes with the creature comforts that anyone putting in overtime would appreciate. Good price and top-notch support policy."

PC World (June 98)

BUILT-IN ADVANCED MANAGEMENT CAPABILITIES LOWER YOUR TOTAL COST OF OWNERSHIP

Whether your business is at home or spread across the globe, the enterprise management technology integrated into our Business Desktops will add real value while lowering your total cost of ownership. Built according to industry-standard initiatives such as Wired for Management, DMI 2.0, PC98 and ACPI, these systems incorporate capabilities for improved asset management as well as remote configurations and diagnostics. Plus, our advanced QSentry Technology assures unsurpassed confidence and security at all times by constantly monitoring the health of your Quantex PCs. Why settle for simple performance when your business can also benefit from compliance and assurance?

Windows® 2000 Ready PCs

Quantex's Windows 2000-Ready Business Desktops come installed with Windows NT Workstation 4.0 to protect your technology investment by providing an optimal upgrade path for future hardware advances and the highly anticipated Windows 2000 operating system.

BUSINESS DESKTOPS

QP6/333 SB-1c — $999

Business lease: $35/Mo. Order Code #pcw0230

- Intel® Celeron™ Processor 333MHz
- 32MB SDRAM Memory / 128KB Secondary Cache
- 4.3GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor (15.8" viewable)
- 64-bit 3D AGP Graphics Card with 4MB RDRAM
- ▲ *New* Intel Pro 10/100 PCI Fast Ethernet Controller w/RJ-45 and Wake-On-LAN Technology
- 32X Max Variable Speed CD-ROM Drive
- 2 Universal Serial Bus (USB) Ports / DMI 2.0
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98
- 3-year limited warranty with 1-year On-Site Service*
- 24-hr./7-day Technical Support
- ▲ QSentry Technology (Including Intel LANDesk Client Manager V.3.1)
- ▲ Cable Modem Ready / Year 2000 Compliant

QP6/400 SB-1c — $1199 Order Code #pcw0231

Above system with Intel Celeron processor 400MHz, 64MB SDRAM, 6.4GB HD

QP6/400 SB-2 — $1499 Order Code #pcw0232

Above system with Intel Pentium II processor 400MHz, 64MB SDRAM, 8.4GB HD, Intel740 3D AGP Video w/8MB and MS Office '97 SBE v2.0

QP6/450 SB-3 — $1899

Business lease: $67/Mo. Order Code #pcw0233

- Pentium® II processor 450MHz
- 64MB PC100 SDRAM Memory / 512KB Secondary Cache
- 8.4GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- ▲ 17" Monitor w/OSD & NEC CromaClear CRT (16.0" viewable), 1600X1200 max.resolution, .25dp
- Intel740 3D 2X AGP Graphics w/8MB SDRAM
- ▲ *New* Intel Pro 10/100 PCI Fast Ethernet Controller w/RJ-45 and Wake-On-LAN Technology
- 32X Max Variable Speed CD-ROM Drive
- 2 Universal Serial Bus (USB) Ports / DMI 2.0
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS IntelliMouse
- ▲ MS Windows NT Workstation 4.0 / Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service*
- 24-hr./7-day Technical Support
- ▲ QSentry Technology (Including Intel LANDesk Client Manager V3.1)
- ▲ Cable Modem Ready / Year 2000 Compliant / Windows 2000 Ready

QP6/450 SB-4 — $2199 Order Code #pcw0234

Above system with 128MB SDRAM, 13GB HD, New Ultra-Fast #9 Revolution IV 128-bit 3D AGP Video & 19" Digital Monitor (18.1" viewable)

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In canada, call 800•793•4167

VALUE MULTIMEDIA

SOFTWARE: Corel Office Suite B • Internet the City • Compton's Interactive Encyclopedia • Body Works 6.0 • Amazon Trail II • MS Money '97 (pre-loaded • American Heritage Talking Dictionary • Dr. Solomons Find-Virus (pre-loaded only) • Compton's Reference Collection • MS Internet Explorer 4.0

QP6/400 M-1c $1099

Business lease: $39/Mo. Order Code #pcw0205

- *New* Intel® Celeron™ Processor 400MHz
- 64MB SDRAM Memory / 12BKB Secondary Cache
- 6.4GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 15" Digital Monitor (13.8" viewable)
- 64-Bit 3D AGP Graphics Accelerator with 4MB
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- 32X Max Variable Speed CD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98 / Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- ▲ Year 2000 Compliant
- *Upgrade to 17" Digital Monitor (15.8" viewable), add $89*
- *Upgrade to 8MB AGP Graphics Accelerator, add $39*

QP6/333 M-1c(with Intel Celeron processor).....$1049
QP6/350 M-1x(with Pentium II processor).....$1149

QP6/400 M-2x $1499

Business lease: $53/Mo. Order Code #pcw0206

- Pentium® II Processor 400MHz
- 64MB SDRAM Memory / 512KB Secondary Cache
- 8.4GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/OSD (15.8" viewable)
- Toshiba MPACT2 3D/DVD Media Accelerator w/8MB RDRAM
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- ▲ *New* 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98 / Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- ▲ Year 2000 Compliant
- *Upgrade to 17" Monitor w/NEC CromaClear CRT for $79*
- *Optional Internal Zip Drive w/one cartridge, add $79*
- *Optional Altec Lansing ACS-251 Subwoofer, add $39*

QP6/350 M-2x(with Pentium II processor).....$1349
QP6/450 M-2x(with Pentium II processor).....$1699

QP6/400 M-3x $1599

Business lease: $56/Mo. Order Code #pcw0207

- Pentium® II Processor 400MHz
- 64MB PC100 SDRAM Memory / 512KB Secondary Cache
- 10.2GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/DSD (15.8" viewable)
- Toshiba MPACT2 3D/DVD Media Accelerator w/8MB RDRAM
- ▲ Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- ▲ *New* 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- ▲ Year 2000 Compliant
- *Upgrade to 17" Monitor w/NEC CromaClear CRT for $79*

QP6/350 M-3x(with Pentium II processor).....$1449
QP6/450 M-3x(with Pentium II processor).....$1799

QP6/450 Best Buy $1999

Business lease: $70/Mo. Order Code #pcw0208

- Pentium® II Processor 450MHz
- ▲ 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- ▲ 13GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- ▲ 19" Monitor w/DSD (18.1" viewable), 1600x1200, .26dp
- Intel740™ 3D 2X AGP Graphics with 8MB SDRAM
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- ▲ *New* 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98 / Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- ▲ Year 2000 Compliant
- *Optional Internal Zip Drive w/one cartridge, add $79*
- *Optional Altec Lansing ACS-251 Subwoofer, add $39*

QP6/400 Best Buy(with Pentium II processor).....$1849

POWER MULTIMEDIA

SOFTWARE: MS Office 97 Small Business Edition v2.0 • MS Money '97 (pre-loaded only) • Office Mate • Day Planner Pro • Power Business Plans • Form Desig • Project Manager Pro • Labels Unlimited • Compton's Reference Collection • Dr. Solomons Find-Virus (pre-loaded only) • MS Internet Explorer 4.0

QP6/350 SM-1x $1399

Business lease: $49/Mo. Order Code #pcw0220

- Pentium® II Processor 350MHz
- 64MB PC100 SDRAM Memory / 512KB Secondary Cache
- 8.4GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/OSD (15.8" viewable)
- Intel740™ 3D 2X AGP Graphics with 8MB SDRAM
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- 32X Max Variable Speed CD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98
- Power Multimedia Software Bundle
- Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- ▲ Year 2000 Compliant
- *Upgrade to 10.2GB Ultra-ATA Hard Drive, add $49*
- *Upgrade to 3rd-Gen. 4.8X DVD-ROM Drive, add $79*
- *Upgrade to Altec Lansing ACS-45.1 PowerCube Speakers with Subwoofer, add $49*
- *Optional Internal Zip Drive w/one cartridge, add $79*

QP6/400 SM-2x $1799

Business lease: $63/Mo. Order Code #pcw0221

- Pentium® II Processor 400MHz
- ▲ 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- ▲ 13GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/OSD (15.8" viewable)
- ▲ *New* 3Dfx 128-bit Voodoo Banshee 3D AGP Video w/16MB Based on award-Winning Voodoo2 3D Technology
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- ▲ *New* 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98 / Power Multimedia Software Bundle
- Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- ▲ Year 2000 Compliant
- *Upgrade to Altec Lansing ACS-45.1 PowerCube Speakers with Subwoofer, add $49*
- *Optional Internal Zip Drive w/one cartridge, add $79*

QP6/350 SM-2x(with Pentium II processor).....$1649

QP6/400 SM-3x $1999

Business lease: $70/Mo. Order Code #pcw0222

- Pentium® II Processor 400MHz
- ▲ 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- 13GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- ▲ 19" Monitor w/DSD (18.1" viewable), 1600x1200, 26dp
- ▲ *New* 3Dfx 128-bit Voodoo Banshee 3D AGP Video w/16MB Based on award-Winning Voodoo2 3D Technology
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- *New* 3rd-Generation 4.8X DVD-RDM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-45.1 PowerCube Speakers w/subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98 / Power Multimedia Software Bundle
- Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- ▲ Year 2000 Compliant
- *Upgrade to Ultra-Fast #9 Revolution IV 128-bit 3D AGP Video w/32MB, add $49*
- *Optional Internal Zip Drive w/one cartridge, add $79*

QP6/450 SM-3x(with Pentium II processor).....$2199

QP6/450 SM-4x $2399

Business lease: $84/Mo. Order Code #pcw0223

- Pentium® II Processor 450MHz
- ▲ 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- ▲ *New* 17.2GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- ▲ *New* 19" Monitor w/NEC CromaClear CRT (18.1" viewable), 1600x1200, .25dp
- ▲ *New* 3Dfx 128-bit Voodoo Banshee 3D AGP Video w/16MB Based on award-Winning Voodoo2 3D Technology
- ▲ Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- *New* 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- ▲ *New* Altec-Lansing ADA-305 Dolby Pro Logic Surround Sound Speakers with subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98 / Power Multimedia Software Bundle
- Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- ▲ Year 2000 Compliant
- *Upgrade to Ultra-Fast #9 Revolution IV 128-bit 3D AGP Video w/32MB, add $49*

SUPER MULTIMEDIA

QP6/450 M-4x SE $2199

Business lease: $77/Mo. Order Code #pcw0209

- Pentium® II Processor 450MHz
- ▲ 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- ▲ *New* 17.2GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- ▲ *New* 19" Monitor w/NEC CromaClear CRT (18.1" viewable), 1600x1200, .25dp
- Intel740™ 3D 2X AGP Graphics with 8MB SDRAM
- ▲ Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- *New* 3rd-Generation 4.8X DVD-RDM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- ▲ Year 2000 Compliant
- *Optional Altec Lansing ACS-251 Subwoofer, add $39*

QP6/400 M-4xSE(with Pentium II processor).....$1999

QP6/450 SM-4x SE $2899

Business lease: $101/Mo. Order Code #pcw0224

- Pentium® II Processor 450MHz
- ▲ 256MB PC100 SDRAM Memory / 512KB Secondary Cache
- ▲ *New* 17.2GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- ▲ 21" Monitor w/DSD (20.0" viewable), 1600x1200
- ▲ *New* 3Dfx 128-bit Voodoo Banshee 3D AGP Video w/16MB Based on award-Winning Voodoo2 3D Technology
- ▲ Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- *New* 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- ▲ *New* Altec-Lansing ADA-305 Dolby Pro Logic Surround Sound Speakers with subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98 / Power Multimedia Software Bundle
- Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- ▲ Year 2000 Compliant
- *Upgrade to Ultra-Fast #9 Revolution IV 128-bit 3D AGP Video w/32MB, add $49*

ULTIMATE GAMING PCS

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Computer viruses are nastier and sneakier than ever. Show them no mercy. Inoculate your system with one of these ruthless virus-killers.

BY STAN MIASTKOWSKI

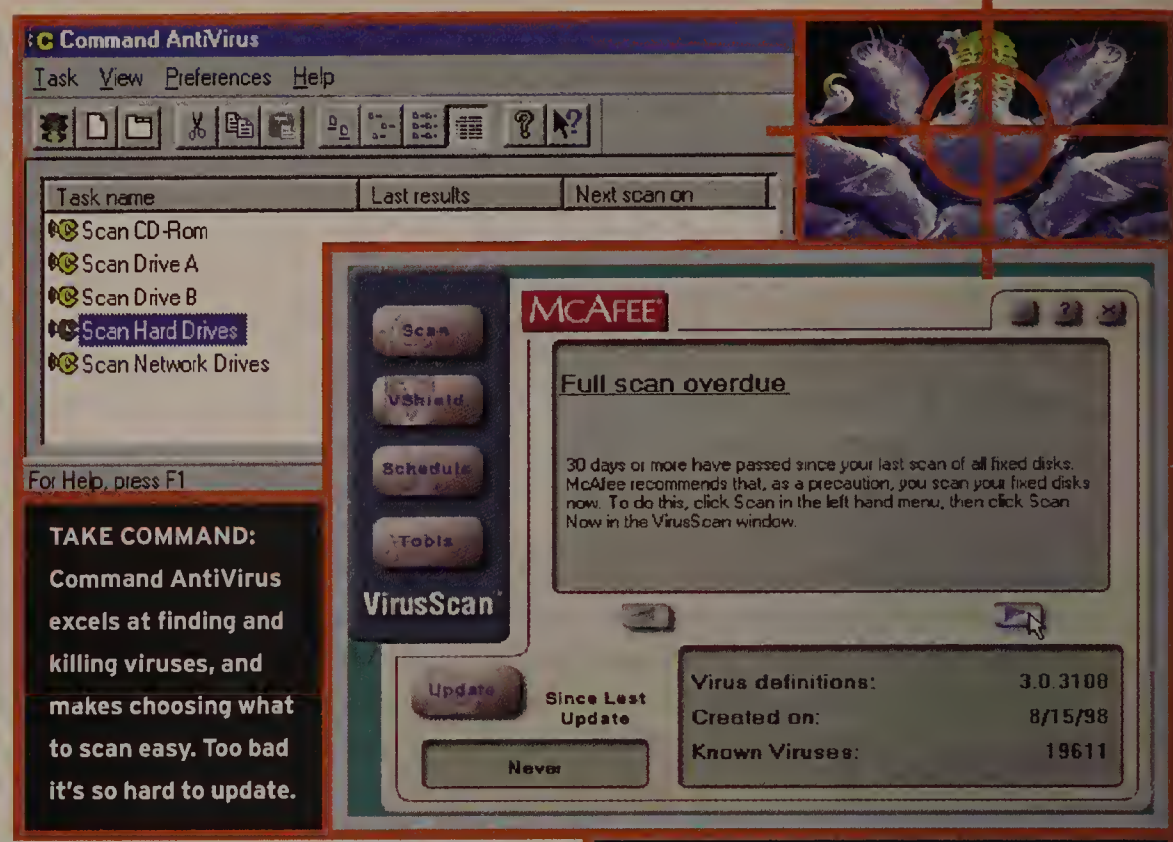
Virucide!

PHOTO ILLUSTRATION BY JEFF BERLIN

viruses in existence are variations on relatively simple themes. The most successful viruses either cause very little damage or include time delays that postpone their damage until days, weeks, or months after they infect your PC. One current example of the time-delay type—a variant of the CIH virus—activates on the 26th of each month and can destroy data on your hard drive. In part because of the widespread publicity it has generated, CIH has caused little damage so far.

Macro viruses are getting more destructive every year. Though most cause no systemwide data damage, macro viruses that affect Excel worksheets can wreak havoc. Case in point: XM/Compat searches Excel worksheets for unprotected data and then makes small, random changes to some data while keeping the number of characters the same. Though current antivirus software can easily detect XM/Compat and remove it, there's no way to fix the damage other than to restore the data from a backup—assuming you have one.

You probably hear episodically about new viruses, mostly via e-mail. But many rumored invaders are urban legends, and the warning message itself, as it gets forwarded and reforwarded, becomes like a virus. To distinguish the real from the mythical, check the U.S. Department of Energy's Computer Incident Advisory Capability Web site at ciac.llnl.gov/ciac, or the independent Computer Virus Myths site at www.kumite.com/myths.



TAKE COMMAND: Command AntiVirus excels at finding and killing viruses, and makes choosing what to scan easy. Too bad it's so hard to update.

HELLO, CENTRAL: McAfee's VirusScan Central provides a handy remote-control-like panel that gives you easy access to program components and status messages through

COMMAND ANTIVIRUS 4.52

PRO: Low price, nearly perfect virus detection, simple interface

CON: Complex update process, some difficulty with wild virus repair

COMMAND ANTIVIRUS, a simple product that does the job without a lot of fanfare, has one fatal weakness: It's so hard to update that we can't recommend it.

Formerly known as F-Prot Professional, this inexpensive ($40) package matched McAfee and Norton in detecting 100 percent of wild viruses. Command ran into trouble repairing wild file and boot viruses, fixing the files only partially. But the program's performance with the common AntiEXE virus—which Command didn't automatically remove from the main boot record—emerged as a more serious deficiency. Though users can overcome the virus manually by booting from a DOS floppy disk and using the package's rescue disk, Command, unlike the other packages, doesn't create a bootable rescue disk at installation—an aggravating obstacle when you need fast help.

ANTIVIRUS SOFTWARE FEATURES COMPARISON

PRODUCT	Street price (12/2/98)	Platforms supported	Scan scheduler	Automatic virus signature updates	Tech support hours (weekday/weekend)	Toll-free phone support	PC World InfoNet number
Command AntiVirus 4.52 561/575-3200 www.commandcom.com	$40	Windows 95/98, NT, 3.1; DOS; OS/2; NetWare	●	○	24/24	●	641
McAfee VirusScan 4.0 800/338-8754 www.mcafee.com	$49	Windows 95/98, NT, 3.1; DOS; OS/2	●	●	8/0	○	642
Norton AntiVirus 5.0 800/441-7234 www.symantec.com	$40	Windows 95/98 [1]	●	●	9/0	●	643
Panda Antivirus 6.005 Platinum 800/603-4922 www.pandasoftware.com	$59	Windows 95/98, NT, 3.1; DOS; OS/2	●	●	24/24	●	644
Sophos Anti-Virus 3.13 888/767-4679 www.sophos.com	$99	Windows 95/98, NT, 3.1; DOS; OS/2; Netware	●	○ [2]	24/24	● [3]	645
Trend PC-cillin 6 [4] 800/228-5651 www.antivirus.com	$40 [5]	Windows 95/98	●	●	11/0	○	646
InDefense 2.10 877/472-3372 www.indefense.com	$50	Windows 95/98, NT, 3.1; DOS	○	[6]	10.5/0	●	647

Best Buy

● Yes ○ No

[1] Package includes version 4.0, which also supports Windows 3.1, DOS, and NT 3.51.

[2] $249 for version with one year of updates.

[3] Calls toll-free on weekdays only.

[4] Prerelease version.

[5] For a hard copy sold only via the Web. Download-only version costs $30.

[6] Product does not require updates.

All products: 904

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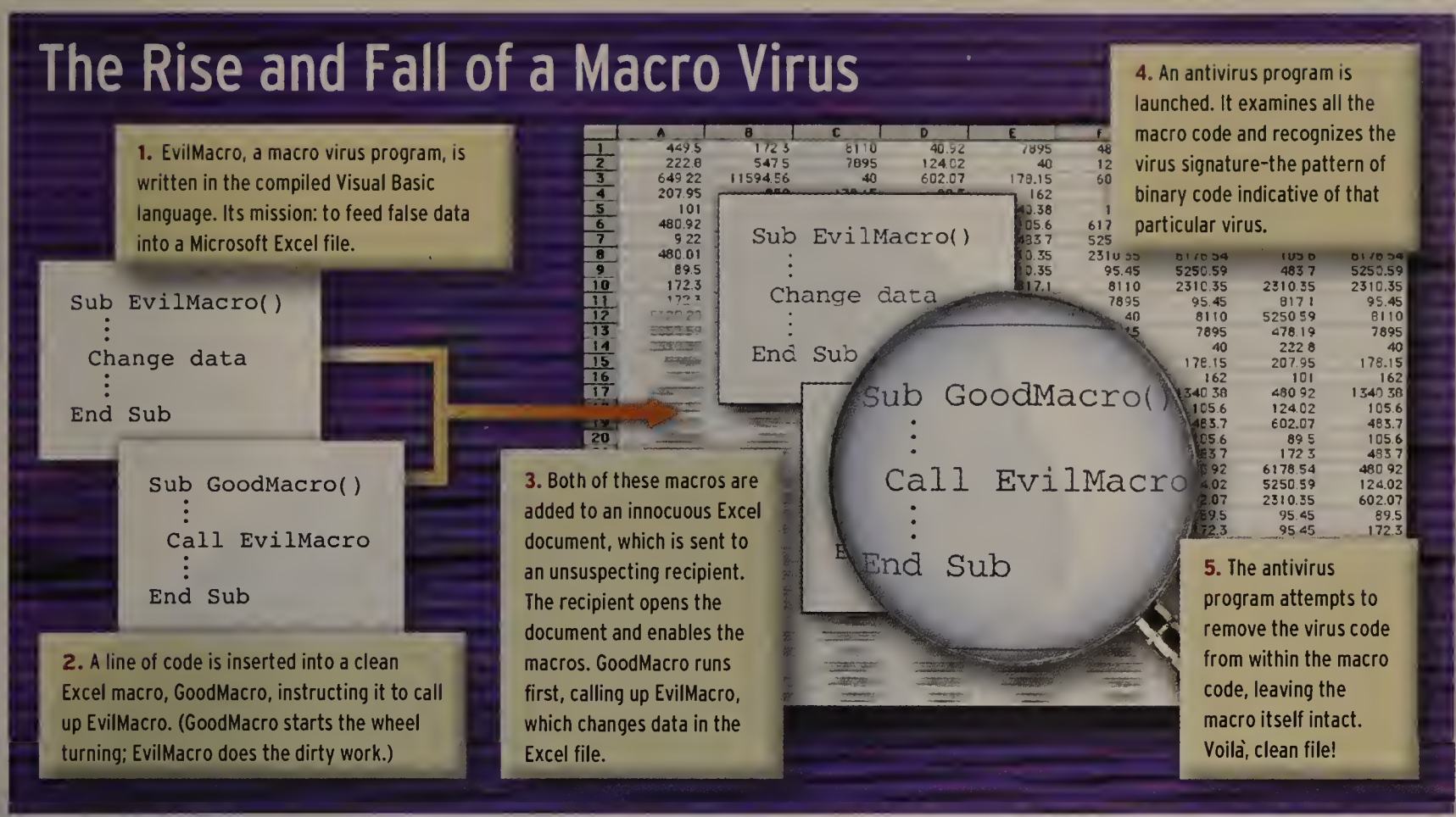

Command's uncluttered, easy-to-use interface offers a solid set of crucial features, including extensive reporting options and a simple scheduler that lets you set up automatic, periodic, full-system scans. It's backed by nonstop toll-free support and one year of free updates. Alas, the complexity of Command's update process makes it a no-go for most users. The package reminds you when your virus signatures are out of date, but you must obtain a user name and password to access the latest code from the Web site. After downloading the updates, you have to wrestle with a complex definition-installation process that's explained only in the widely unread README file.

MCAFEE VIRUSSCAN 4.0

PRO: Outstanding virus detection and removal, remote-control-like interface, easy to use

CON: Slowest scan time

AS MAKER OF one of the oldest and most popular antivirus packages, McAfee has a reputation for effectiveness and cutting-edge features to uphold. With the $49 McAfee VirusScan 4.0, the runner-up to our Best Buy, it succeeds. VirusScan performed perfectly on wild virus detection (like Command and Norton) and repair (like Panda), and strongly on zoo viruses. Its one major drawback is scan speed; McAfee took two to three times longer to scan a 1GB hard drive than the other packages. If you always schedule full-system scans for evenings and other off-peak times, this won't pose a problem, but if you want to scan during peak hours, you'll have a long wait.

A new remote-control–like interface called VirusScan Central makes navigating through McAfee's many features easy. Buttons that perform common tasks appear prominently in front, while other, less conspicuous buttons lead you to more advanced or specialized settings. Useful messages pop up each time you start VirusScan, reminding you to perform such common (and essential) chores as updating your virus signatures. A simple wizard guides you through a multitude of settings and choices. The package actively scans all e-mail attachments and downloaded files before you open them, and it offers protection against the notorious ActiveX and Java applets; it even includes a miniature firewall that lets you block access to certain unwanted Web sites or IP addresses—a useful filter for parents. ▶

TIPS FROM THE REAL WORLD

Michael Brozovich, an Arkansas-based real estate broker, doesn't believe in using antivirus software. He thinks antivirus makers "use scare tactics to sell software" and is perturbed by antivirus software's "constant updates, potential conflicts with other software, and performance hits." Brozovich admits luck has contributed to his success in avoiding viruses so far. His "gospel rules":

- Don't accept disks from friends. Even well-meaning people can pass along contaminated files.
- Don't download Internet files, especially from newsgroups. If you must do so, take your chances with large commercial sites, which are more likely to check files for viruses before posting them.
- Don't open executable files attached to email. Just delete the messages.

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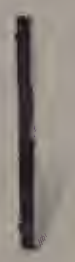

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TEST REPORT

Wild Viruses Lassoed With Ease

Command, McAfee, and Norton share perfect records on wild virus detection.

ANTIVIRUS PROGRAM[1]	Wild boot virus detection (percent)	Wild file virus detection (percent)	Wild macro virus detection (percent)	Zoo file virus detection (percent)	Zoo macro virus detection (percent)	Detect/repair wild macro virus	Detect/repair wild file virus	Detect/repair wild boot virus	Detect/repair main boot record infection	False positives	Scan time (minutes: seconds)
Command AntiVirus 4.52	100	100	100	99	98	●/●	●/○[2]	●/○[2]	○/○	0	9:24
McAfee VirusScan 4.0	100	100	100	95	100	●/●	●/●	●/●	●/●	0	27:22
Norton AntiVirus 5.0*	100	100	100	99	100	●/●	●/●	●/●	●/○	1	12:54
Panda Antivirus 5.0	100	99.9	99.9	80.6	75.5	●/●	●/●	●/●	●/●	12	7:42
Sophos Anti-Virus 3.13	100	100	99.9	99	100	●/●	●/○	●/●	●/○	2	8:30
Trend PC-cillin 6[3]	100	99.9	99.9	99	100	●/●	●/●	●/○	●/●	2	13:26

*Best Buy ● = yes ○ = no

Faster

TEST PC WORLD CENTER **HOW WE TEST** On a Compaq Pentium II-266 DeskPro PC, Joe Wells of the Antivirus Test Lab at Wells Research tested each package's ability to detect 80 wild boot viruses, 89 wild file viruses, 21 polymorphic viruses, 85 wild macro viruses, 6124 samples of 6124 zoo file viruses, and 4482 samples of 1736 zoo macro viruses; and to remove 17 wild viruses, including the 15 most commonly reported. Each test used the most current virus signatures available on the vendor's Web site as of October 6, 1998. The scan test measured time to review 10,973 files on a 1GB hard drive. [1]Tegam InDefense Pro 2.10 could not be tested using these procedures; see "InDefense: An Antivirus Utility With a Difference," on page xxx. [2]Partial repair. [3]Prerelease version.

Updating VirusScan is easy and automatic. A pop-up dialog box reminds you to refresh, supplying a button to connect directly to McAfee's Web site. If you want to receive updates as soon as they're available, McAfee will "push" updates directly to your PC via e-mail; none of the other reviewed programs has the same feature. The company claims to provide daily updates if the need arises and free signature updates "for the life of the product"—that is, until the next version of VirusScan comes out, when the format of the signature files may change.

NORTON ANTIVIRUS 5.0

PRO: Excellent virus detection and removal, effective new features such as Quarantine, improved interface

CON: Begins to charge for virus signature updates after one year

OUR BEST BUY in both last year's roundup and this year's, Norton AntiVirus remains a step ahead of its competitors with version 5.0. With top-notch protection, an idiot-proof interface, simple updating, and a wealth of truly useful features, it won easily.

Like Command and McAfee, NAV detected 100 percent of the wild viruses, and it found more zoo viruses than any other package (over 99 percent). The program produced two minor testing problems that shouldn't affect most users: It produced one false positive, reporting a virus when none existed. And it retains a design flaw we encountered last year: When we infected the main boot record, the package hung the system without telling us what to do. A working fix (which we tested) is available on Symantec's Web site.

Norton AntiVirus 5.0 includes several useful new features. The program now automatically detects malevolent ActiveX and Java applets—if they show up. The program's Quarantine feature tucks infected files away in a protected area while you check online for a fix or contact Symantec tech support. Scan and Deliver encodes suspected viruses and e-mails them directly to Symantec's AntiVirus Research Center for a possible fix. When the easy-to-install program finds a virus, it clearly shows you what to do; a new, cleaner interface puts major choices out in front, making its most frequently used features more accessible.

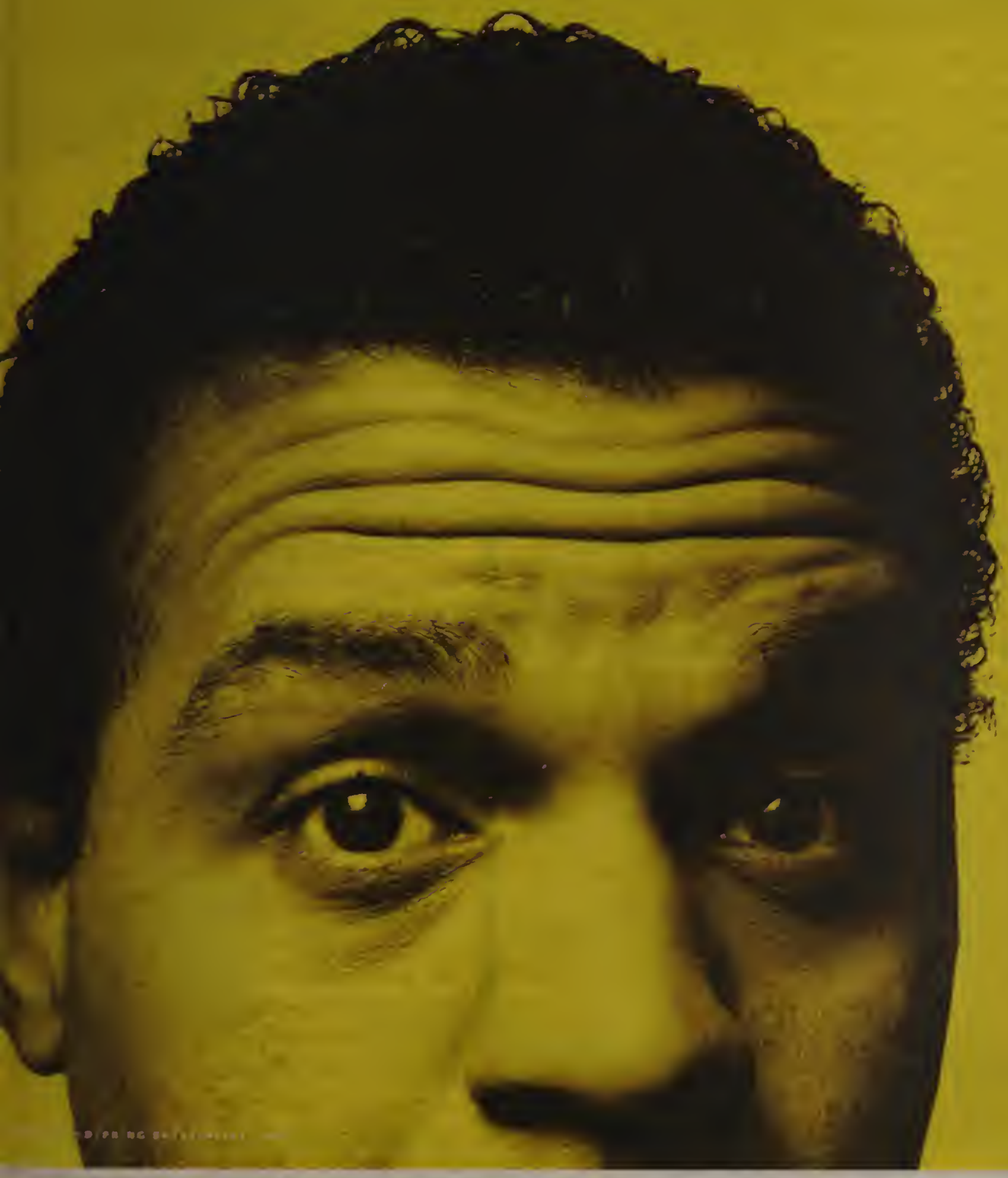
Updating NAV is simple: The program doesn't offer McAfee's push technology, but it will automatically download new signatures via the Internet or remind you when it's time to do so. Most conveniently, Symantec offers unique incremental updates, which download only the changes in signature files rather than the entire, time-consuming database. ▶

TIPS FROM THE REAL WORLD

Larry Bridwell, product development manager at the International Computer Security Association, does research on viruses and antivirus products. His advice:

- Be wary of e-mail attachments. If you're unfamiliar with the sender, don't execute them at all.
- If you download executable files from the Internet, Usenet newsgroups, or FTP sites, scan them in a safe area before executing.
- Keep your corporate policies up-to-date. Educate employees about virus dangers.
- Update your antivirus utility's signatures frequently—at least once a month.

The Internet allows you to talk to people in Germany, Russia, China and now, even customer support.



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One minor gripe: You get one year of free updates with NAV, after which you pay $4 a year. Though this cost isn't wallet-busting—and you'll probably want to upgrade to a new version after a year anyway—it's a nickel-and-diming way to do business.

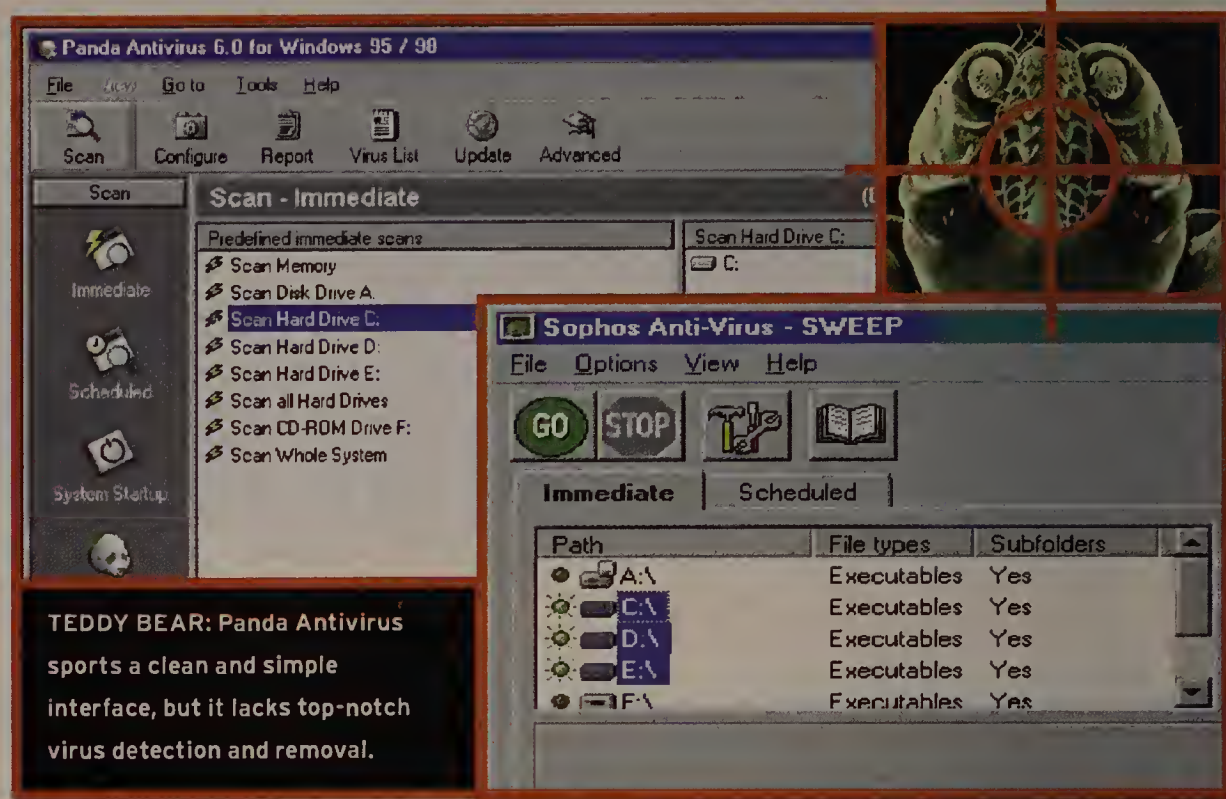
PANDA ANTIVIRUS 6.005 PLATINUM

PRO: Clean user interface, faster than any other package, easy to update

CON: Had problems detecting macro viruses, produced many false positives

ONE OF THE LEADING antivirus packages in Europe but new to the United States, Panda Antivirus fell behind the major domestic packages in our tests. Though the latest version of the product (6.005 Platinum) found every wild boot, file, and polymorphic virus, it detected only 94.1 percent of wild macro viruses, 81.3 percent of zoo file viruses, and 75.5 percent of zoo macro viruses—compared to zoo catch rates in the upper 90s (and 100 percent, or close to it, on wild macro viruses) for all the other packages. It also produced 19 false positives, far more than any other product we looked at. The company says it is working to improve the product's performance in connection with false positives and zoo viruses, and it will post a fix for the macro virus detection problem on its Web site by the time you read this. On the plus side, Panda works quickly: Its scan time of just over 7 minutes was faster than that of any other product.

Panda Antivirus runs hot and cold in other ways, too. Its well-designed interface features big, bright status screens that show you what it's doing at all times. Unlike any other product, it scans at Internet protocol levels such as POP and HTTP, giving you extra protection. The company also provides all-hours toll-free support and free updates for the life of the product, and the simple updating procedure takes just the click of a button. But we found the main scanning screen confusing: It took us quite a while, for example, to figure out how to get the product to examine particular drives.



TEDDY BEAR: Panda Antivirus sports a clean and simple interface, but it lacks top-notch virus detection and removal.

OPEN YOUR WALLET: The unadorned interface of Sophos Anti-Virus makes finding infections simple, but its $99 price doesn't cover any future updates you may need.

SOPHOS ANTI-VIRUS 3.13

PRO: Excellent virus detection, versatile scheduler, well-designed interface

CON: Expensive, complicated virus repair

SOPHOS CARRIES an excellent reputation for supplying antivirus software to large networked installations. But as a standalone product, Sophos Anti-Virus 3.13 proves a poor choice. Despite its high price of $99—twice the competition's going rate—you get no updates. A version that does supply a single year of updates costs an outrageous $249.

Sophos does a near-perfect job detecting both wild and zoo viruses, qualifying it as a top-notch performer in these areas. But when it comes to making repairs, the package is far less impressive: The company believes that you should never attempt to repair a file that's infected with a file virus (a belief few antivirus researchers share). As a result, Sophos Anti-Virus offers users only two corrective options: renaming the file (which makes it unreadable but stops the infection) or deleting it. In addition, Sophos's recovery from the boot sector virus AntiEXE was ugly, slow, and ultimately unsuccessful. After 45 minutes of complicated futzing, the product told us we had a virus—but it didn't offer any further instructions. The company says it is reviewing this problem. ▶

TIPS FROM THE REAL WORLD

Businessman David Allison, an inveterate computer tinkerer and "resident computer guru" for the Petal, Mississippi, Chamber of Commerce, reports that he's tried virtually every major antivirus program. He insists, "I've seen the cost of viruses and I don't want to pay it." His straightforward approach:

- Use common sense. You don't have to be careless because other people are.
- If you don't know the sender of an e-mail attachment, don't open it. Delete it right away.
- Immediately after you perform a full-system virus scan, make a full backup.
- Always scan a floppy disk as soon as you put it in the drive. If you find a virus, tell the person who gave you the disk.
- Be especially cautious about downloading files from newsgroups.

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3D performance

Millennium G200 8MB AGP	368

3D WinBench 99 at 1024x768x16bpp@85Hz

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matrox

INDEFENSE

An Antivirus Utility With a Difference

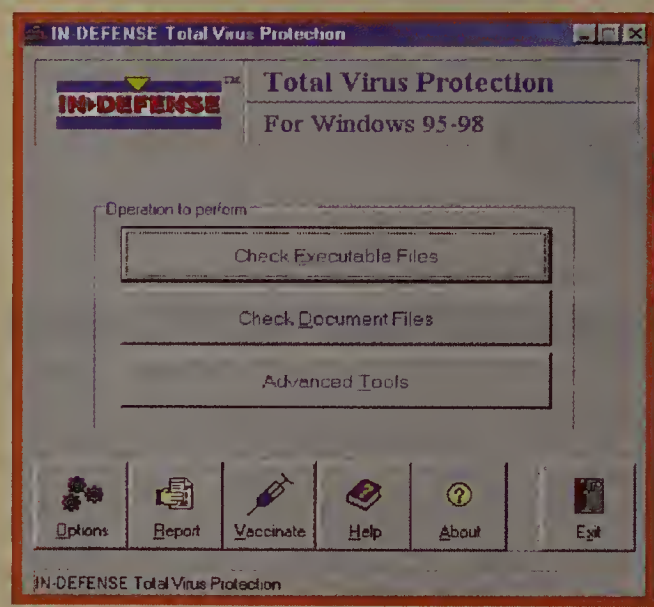
BECAUSE IT'S A UNIQUE ANIMAL in the antivirus menagerie, we couldn't test Tegam International's InDefense like the other antivirus utilities. The product never needs virus signature updates—but even so, we can't recommend InDefense as your only line of defense.

InDefense builds on old techniques to protect your system against viruses. First it "vaccinates" all executable files on your PC, taking a snapshot of the file elements. This older technique is particularly good at detecting file viruses; since executable files shouldn't change, any modification is a strong symptom of infection. InDefense also looks for viral activity—a program's attempt to reproduce itself.

But InDefense has a catch-22. It assumes that you have a virus-free system before you install it, which is not always the case, even with a new PC. To use InDefense on any system you weren't sure was clean, you'd first have to run a scan with another antivirus utility.

Caution: Live Virus Tests. Because InDefense isn't a scanner, we couldn't use it to scan our system for viruses. Instead, we installed InDefense, activated a suite of live viruses, and then ran the program. InDefense stopped all 15 wild boot, macro, and file viruses we used. But unlike other antivirus programs, the package assumes a high level of user knowledge, and often asks you to decide whether you've got a problem. For example, during our tests, one warning message read, 'If you know that the partition sector of your hard disk has been changed for normal reasons (i.e. OS upgrading), then press [A]. If it is due to a virus, press [R].' In dealing with macro viruses, InDefense presumes that all "uncertified" macros are viral and that all certified macros are clean, but this isn't always so. (You can certify specific macros that you've created yourself or that you otherwise know are safe; companies such as Microsoft also certify macros.) Though InDefense's interface is fairly straightforward, its dialog boxes and manual are almost impenetrable, written in a combination of technical jargon, marketing-speak, and bad grammar.

Not the Solution. Though we recognize that current scanning-style antivirus products aren't perfect and that they necessitate an endless parade of updates, we remain unconvinced that InDefense offers enough protection for the average desktop computer.



NO UPDATE NEEDED: InDefense doesn't require virus signature updates, but it does need a clean PC before installation. You'll have to run a different antivirus product in order to confirm your system's health at the outset.

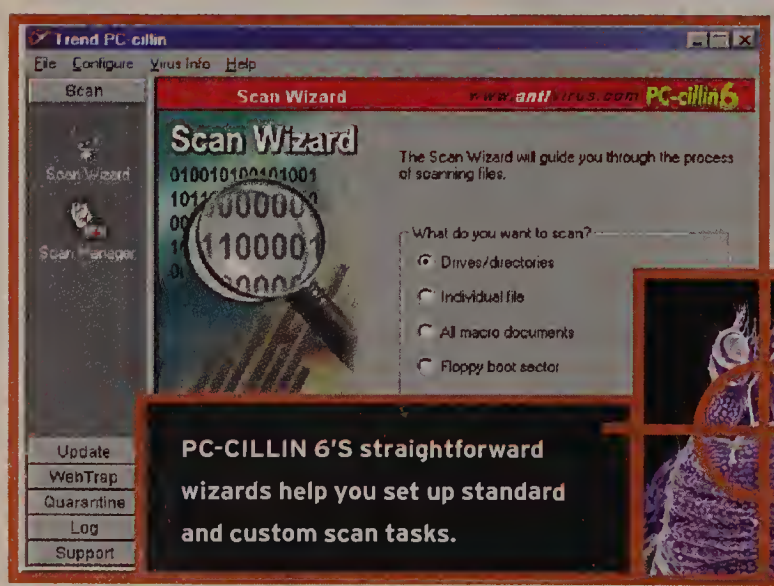
TREND PC-CILLIN 6

PRO: Great interface, strong features, low price

CON: Prerelease version had trouble repairing a particular boot virus

EVEN IN ITS PRERELEASE state, PC-cillin's latest revision impressed us. Version 6 presents a clean, usable interface; several handy features; a competitive price ($40 for a hard copy, $30 for the download), and near-perfect virus detection. The only testing problem we saw was the program's failure during repair of a wild boot virus: The real-time monitor detected the virus but offered no repair option, and a manual scan found no virus at all. Trend Micro sent a patch that fixed the problem; the fix will be included in the final version, due to reach store shelves in mid-January.

PC-cillin is packed with useful features. It's the only package we've seen that includes a wizard for setting up custom scan tasks, and the only one that uses Internet Explorer 4.0's Active Desktop for virus information. (Alternatively, you can obtain updates via the straightforward Update Now or Update Later buttons, or you can instruct the program to check for updates regularly at a preset time, such as 10 minutes after you start your system.) Like McAfee VirusScan, PC-cillin protects against destructive applets and blocks access to unwanted Web sites; like Norton, it offers a quarantine feature that shunts infected files into a protected and isolated area from which the infection can't spread. All this is especially impressive when you consider that the downloaded version of PC-cillin is the cheapest product here.



PC-CILLIN 6'S straightforward wizards help you set up standard and custom scan tasks.

Stan Miastkowski is a contributing editor for PC World. *Testing was performed by Joe Wells at Wells Research.* ■

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PC World Magazine, August '98

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RAM	64M8 100MHz SDRAM	64M8 100MHz SDRAM	128M8 100MHz SDRAM	128M8 100MHz SDRAM	128M8 100MHz SDRAM
Hard Drive	8.4G8 Ultra ATA hard drive◊	8.4G8 Ultra ATA hard drive◊	10G8 Ultra ATA hard drive◊	13.5GB Ultra ATA hard drive◊	13.5GB 7200RPM Ultra ATA hard drive◊
Monitor	17" Micron 700Vx monitor (15.9" display)	17" Micron 700Vx monitor (15.9" display)	17" Micron 700Vx monitor (15.9" display)	19" Micron 900Lx monitor (18" display)	15" Micron LCD display flat panel
DVD/CD-ROM	32X max speed CD-ROM drive	32X max speed CD-ROM drive	6X DVD-ROM drive (free upgrade from 4.8X DVD-ROM drive)	6X DVD-ROM drive (free upgrade from 4.8X DVD-ROM drive)	6X DVD-ROM drive (free upgrade from 4.8X DVD-ROM drive)
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Graphics	nVidia Riva 128, 8M8 SGRAM 3D 2X AGP graphics	nVidia Riva 128, 8M8 SGRAM 3D 2X AGP graphics	16M8 Diamond Viper 550 TnT 2X AGP graphics	16M8 Diamond Viper 550 TnT 2X AGP graphics	16MB Diamond Viper 550 TnT 2X AGP graphics
Sound System	PCI 64-voice Wavetable sound	PCI 64-voice Wavetable sound	PCI 128-voice Wavetable sound	PCI 128-voice Wavetable sound	PCI 128-voice Wavetable sound
Speakers	Advent AV009 stereo speakers	Advent AV009 stereo speakers	Advent AV009 stereo speakers	Monsoon MM1000 3-piece flat panel speaker system	Monsoon MM1000 3-piece flat panel speaker system
Warranty	5-year/3-year Micron Power℠ limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty
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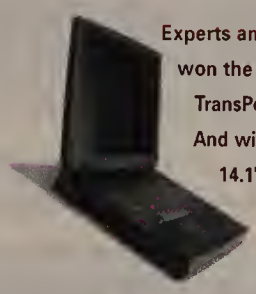

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Cache	512KB L2 pipeline burst cache	512KB L2 pipeline burst cache	512KB L2 pipeline burst cache	512KB L2 pipeline burst cache
RAM	32MB EDO DRAM	64MB SDRAM	64MB SDRAM	12BMB SDRAM
Hard Drive	3.2GB hard drive (removable)◊	3.2GB hard drive (removable)◊	3.2GB hard drive (removable)◊	3.2GB hard drive (removable)◊
Monitor	12.1" SVGA TFT display	13.3" XGA TFT display	14.1" XGA TFT display	14.1" XGA TFT display
Extra Storage	3.5" floppy disk drive (dedicated bay)	3.5" floppy disk drive (dedicated bay)	3.5" floppy disk drive (dedicated bay)	3.5" floppy disk drive (dedicated bay)
DVD/CD-ROM	24X CD-ROM drive (dedicated bay)	24X CD-ROM drive (dedicated bay)	24X CD-ROM drive (dedicated bay)	DVD-ROM II drive (dedicated bay)
Graphics	4MB AGP graphics accelerator	4MB AGP graphics accelerator	4MB AGP graphics accelerator	4MB AGP graphics accelerator
Sound System	Built-in stereo speakers & microphone	Built-in stereo speakers & microphone	Built-in stereo speakers & microphone	Built-in stereo speakers & microphone
Warranty	5-year/1-year Micron limited warranty	5-year/1-year Micron limited warranty	5-year/1-year Micron limited warranty	5-year/1-year Micron limited warranty
Software Included	Microsoft® Windows® 98 System Wizard Mobile Client™ Norton AntiVirus	Microsoft Windows 98 Microsoft Office Small Business Edition System Wizard Mobile Client™ Norton AntiVirus	Microsoft Windows 98 Microsoft Office Small Business Edition System Wizard Mobile Client™ Norton AntiVirus	Microsoft Windows 98 Microsoft Office Small Business Edition System Wizard Mobile Client™ Norton AntiVirus
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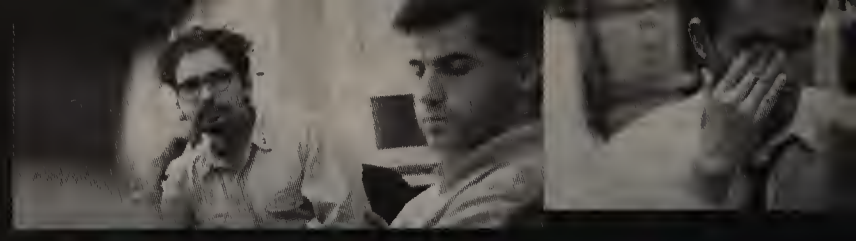

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— *PC World*
November 1998

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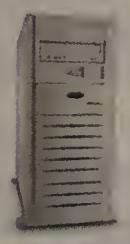

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Emergency Management Port Console
Microsoft NT Server 4.0 (10-user license)

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Options for 512KB, 1MB or 2MB L2 cache Xeon processors
8GB ECC EDO support (32 DIMM sockets)
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Optimal Resolution	SVGA 800 x 600	SVGA 800 x 600	SVGA 800 x 600	XGA 1,024 x 768
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*Brightness in ANSI lumens may vary up to 10% depending on room lighting and lamp conditions.

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ILLUSTRATIONS BY GORDON STUDER

taking DVD for a spin

DVD isn't for everyone. But if you want your PC to be ready for the software of the future and the latest Hollywood blockbuster movies, we'll steer you in the right direction.

By Michael Goodwin

SAY *DVD*, and most people think of movies on disc that you rent at your local video store—but this new format means business, too. The same technology that paints the *Titanic* vividly across your TV screen is also surfacing in PCs; one out of five desktop computers that *PC World* receives each month for review has a DVD-ROM drive. And we're finally seeing business software shipping on this high-capacity format.

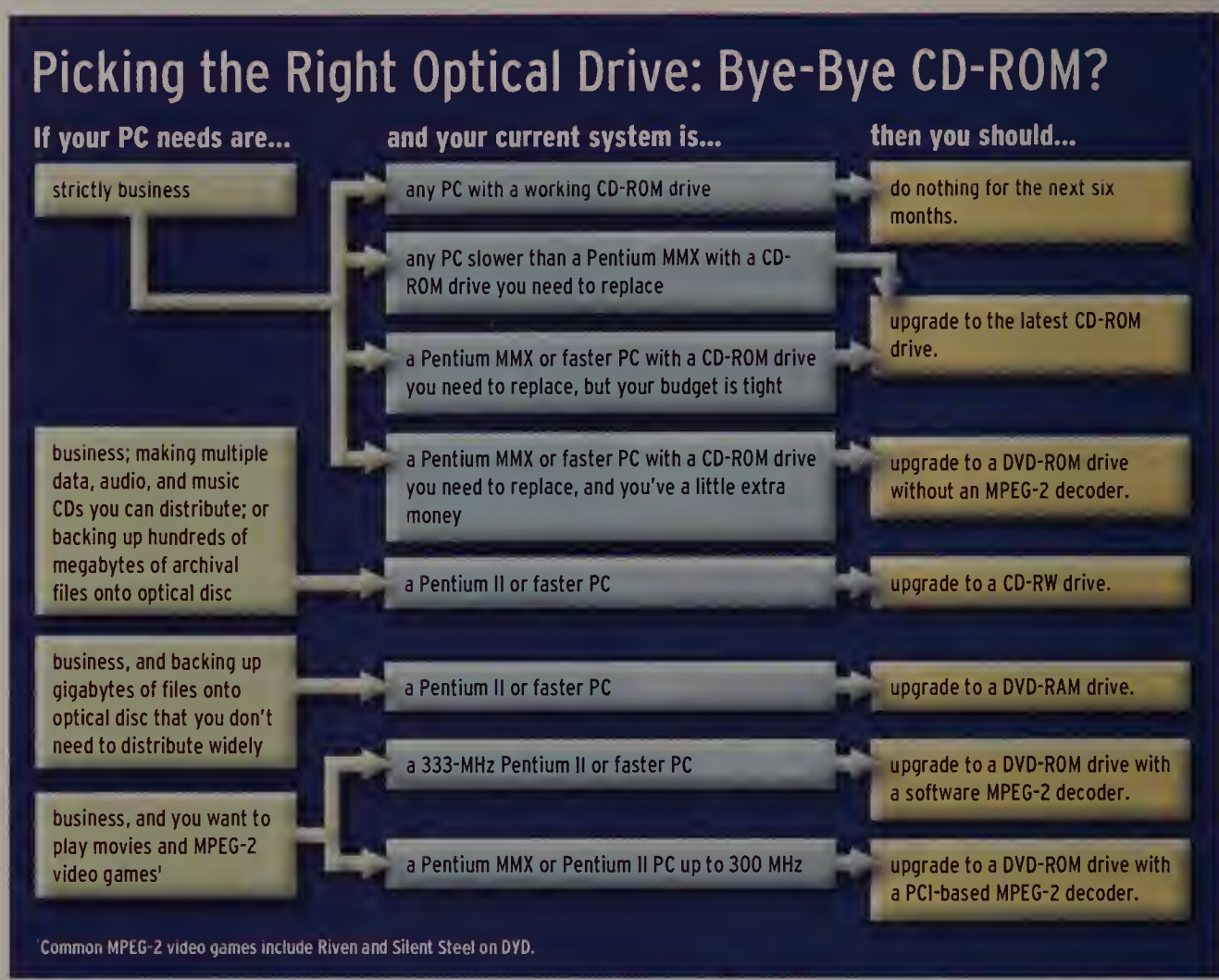
"The trickle of DVD-based productivity programs will become a steady stream in the next few years," says Dataquest's Mary Bourdon. We found that you can prepare for the influx ▶

with little effort or expense. DVD-ROM discs have over seven times the capacity of CD-ROM discs (4.7GB compared to 650MB)—enough space for vendors to include appealing extras like multiple camera angles and language tracks. And based on our tests with real-world applications, the latest DVD-ROM drives play CD-ROM discs with no performance hit. If you install an MPEG-2 decoder (either a PCI board or a software package), you can even watch DVD movies. The cost can be minor: You can upgrade to DVD-ROM for as little as $50 over the price of a CD-ROM drive.

If you are like many people, you're probably overwhelmed by all the optical options: Should you stick with your CD-ROM drive, or move to a DVD-ROM drive that also read CDs? Should you opt for a writable drive, such as CD-Rewritable or DVD-RAM? If DVD-ROM makes the most sense, should you get a kit with an MPEG-2 decoder card, or one with software decompression? Which kit is the best?

We speed-tested the bare DVD-ROM drives from Creative Labs, Hitachi, Sony, and Toshiba (prices range from $102 to $135). We also installed and tested DVD-ROM kits (which include a DVD-ROM drive plus an MPEG-2 decoder board) from Creative Labs ($250), Hi-Val ($279), Newcom ($229), Pacific Digital ($229), and Sony ($349). Finally, to compare DVD performance with that of another popular optical format, CD-RW, we tested Hewlett-Packard's CD-Writer Plus 8110i.

Picking the Right Optical Drive: Bye-Bye CD-ROM?



DECISIONS, DECISIONS

DVD-ROM MAKES good sense if you're a business user who wants to be ready for the next generation of DVD-savvy software, a home-office magnate with a lust for the latest technology, or even just someone who might be interested in watching DVD movies on the computer.

Tempting as the upgrade may sound, though, it's not for everyone. Despite reports of CD-ROM's imminent demise, many people will be perfectly content sticking with that venerable format. Very few business titles are available on DVD; at press time, we found only three: PhoneDisc's PowerFinder, a nationwide phone directory; DeLorme's AAA Map'n'Go, a

DVD-ROM DRIVE KITS — FEATURES COMPARISON

	PRODUCT	Street price with hardware decoder (11/20/98)[1]	Street price with software decoder (11/20/98)[1]	Scorecard: Overall rating[2]	Performance	Features	Installation	Support quality/ policies	Documentation
1	Sony DDU-220E/H5X DVD-ROM 800/352-7669 www.sony.com	$349	n/a	best	good	outstanding	very good	very good/ good	excellent
2	Creative Labs PC-DVD Encore 5X 800/998-5227 www.soundblaster.com	$250	n/a	good	very good	satisfactory	good	satisfactory/ poor	very good
3	Hi-Val DVD-3 714/953-3000 www.hival.com	$279	$149	good	very good	satisfactory	good	satisfactory/ satisfactory	poor
4	Newcom Cinema II Plus[5] 800/563-9266 www.newcominc.com	$229	$149	good	very good	good	good	satisfactory/ poor	excellent
5	Pacific Digital DVD 2X DVD-ROM 818/865-9055 www.pacificdigitalcorp.com	$229	n/a	poor	very good	limited	poor	satisfactory/ poor	excellent

Best Buy ● Yes ○ No
n/a = not applicable

[1] Average of quotes from several companies listed on www.pricewatch.com.
[2] Based on ease of installation (35 percent), performance (25 percent), price (20 percent), features (10 percent), and support (10 percent).

route-planning program; and Microsoft's Encarta multimedia reference title. Furthermore, if you want to cut your own disks or use your drive for system backups, neither CD-ROM nor DVD-ROM will do; you'll need a writable format such as CD-RW (see "Write On"). Finally, you pay an extra premium for DVD-ROM. You can get a fast CD-ROM drive replacement for $50; even a bare-bones DVD-ROM drive costs at least $100.

If you use your PC for business only, and your 4X or faster CD-ROM drive works fine, sit tight—and check DVD-ROM prices again in six months. Ditto if you're buying new PCs in volume (say, ten or more) on a tight budget. But if just a few of the CD-ROM drives in your office fleet need replacement and you have a little extra in the budget, consider DVD-ROM drives without add-ons such as an MPEG-2 decoder, especially if you'll be installing the drives in newer PCs. If you want to play games or watch movies after business hours, and your PCs are equipped with a 333-MHz Pentium II or faster processor, look for DVD-ROM drives with software-based MPEG-2 decoders ($149 and up).

DVD-ROM kits can be an installation nightmare, so make sure the vendor you buy from offers good support. That's the main reason **Sony's DDU-220E/H5X DVD-ROM** kit captures our Best Buy, in spite of its hefty $349 price. Sony offers around-the-clock help, and it's the only company whose support technicians answered our calls right away. This kit also produces near-flawless DVD video and audio output and gives you the best software bundle, which includes Funk & Wagnall's Unabridged Encyclopedia on CD-ROM.

Best Buy

MY OFFICE, MY HOME

IF YOU RUN A SMALL OFFICE or home office, DVD-ROM holds even more appeal, especially if your PC doubles as an entertainment station. You might play an occasional DVD game while you wait for a late-night fax to arrive, watch a movie on your PC, or even attach a cable to your TV so the family can enjoy the movie (see "Battle For the Boob Tube"). And since you're probably outfitting only one PC, you may not mind paying a little extra for cutting-edge features—especially if you're looking to replace a slow or broken CD-ROM drive.

Once you opt for DVD-ROM, you must figure out whether you need a hardware or a software decoder. If you plan to watch DVD movies on your TV, consider spending the $229 to $349 on a DVD-ROM drive kit with an MPEG-2 decoder board. The kit is especially recommended for PCs running at 300 MHz or slower, since effective software decoding requires a Pentium II chip running at 333 MHz or faster. Also, a decoder board sends sharp images to your TV via a cable; software-only decoders force you to use output from your video card, a setup that often yields poor video quality. But if you've already shot your budget on a fast PC, consider a DVD-ROM drive with a software decoder, particularly if you don't need to display video on your TV.

If a new PC figures in your small- or home-office plans, we suggest spending an extra $150 to $300 over the standard CD-ROM configuration to get a DVD-ROM drive and a preinstalled hardware decoder board. You can't usually choose which make of DVD-ROM drive your vendor puts into your PCs, but chances are good you'll get Toshiba's SD-M1202 or Hitachi's GD-2500, both of which performed very well in our tests. ▶

Comments	Features: Drive model/ street price [1]	Features: MPEG-2 decoder board	Support: Toll-free support	Support: Weekday support hours	Support: Weekend support hours [3]	PC World InfoNet number [4]
Pricey, but it's easy to install, delivers excellent image and sound quality, and has the best support of the bunch.	Sony DDU220E/ not available	Sigma Designs Hollywood Plus	●	24	48	705
Easy installation, on-screen DVD player works like a TV remote control. But images appear fuzzy in some display modes, and support reps managed to elude us.	Creative DVD5240E/ $125	Creative Dxr2	○	14	22	706
Excellent image and sound quality, but lacks some installation instructions. We had to leave repeated messages for support.	Toshiba SD-M1202/ $135	Sigma Designs Hollywood Plus	●	9	5	707
Low-price champ, excellent image and sound quality, easy to install, but support was hard to reach.	Hitachi GD-2000/ $102	Sigma Designs Hollywood Plus	●	18	18	708
Avoid this kit—at least in its current incarnation. Missing cables and drivers hampered installation, error messages went undocumented, and support proved unhelpful.	Hitachi GD-2500/ $125	Sigma Designs Ventura II	●	9	none	709

[3] Sum of Saturday and Sunday hours.

[5] Will ship with 5X/24X DVD-ROM drive starting January 1999.

[4] For more information about all products in this article, select PC World InfoNet no. 910 or visit www.pcworld.com/infonet.

Even if you don't need hardware-based MPEG-2 decoding now, we still recommend paying the extra money if you think you'll *ever* watch movies or play DVD games during the computer's lifetime. Installing these boards yourself can be a harrowing experience.

AND THE WINNER IS . . .

OF THE FIVE KITS we reviewed, the Sony earns our Best Buy, despite its high $349 price. It installed without a hitch, ran perfectly, comes with the best software bundle here, and puts out great video and audio. And Sony delivers the best support of the bunch—a crucial consideration, in light of the setup hassles you may encounter.

That said, the Sony's not the top pick for *all* users. Tech-savvy users on a budget—especially those who don't mind spending time on the phone troubleshooting—should look at the Newcom and Hi-Val kits, too. The $229 Newcom is one of the lowest-cost kits in the roundup, and Newcom offers a software MPEG-2 decoder as a $149 alternative to the hardware kit. The $279 Hi-Val also yields first-class images and sound. On the other hand, Pacific Digital's kit is simply not ready. Until the company upgrades its hardware and support quality, pass it by.

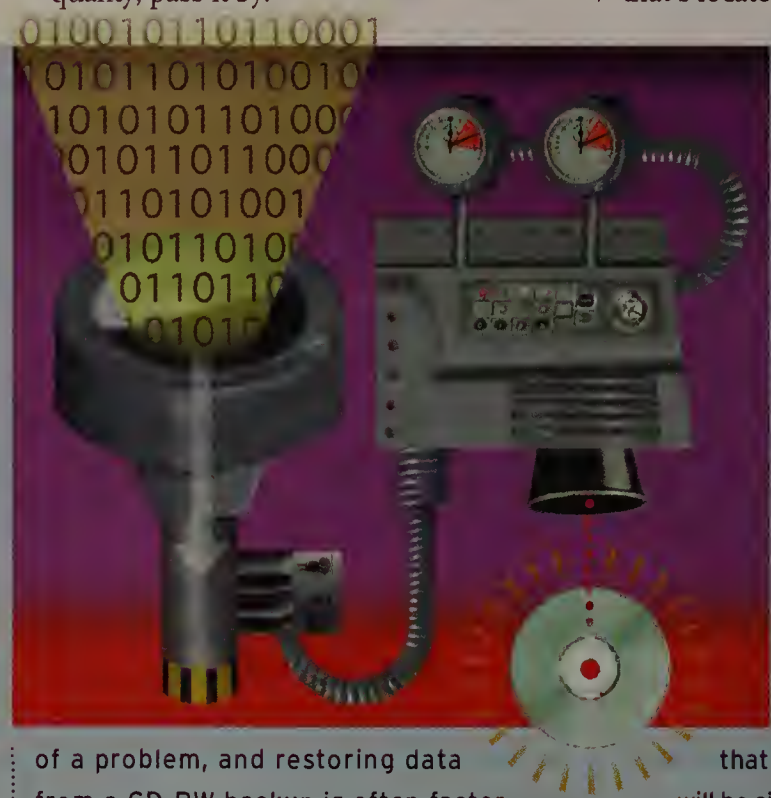
Anatomy of a DVD-ROM Kit

CHOOSING THE top DVD-ROM drive kit means balancing price, features, performance, ease of installation, and support. Prices vary considerably—from $229 for the Newcom kit to $349 for the Sony. The most expensive kit, the Sony, turns out to be the best buy for most people.

Kit features don't vary significantly. All kits contain a DVD-ROM drive, a hardware decoder board, and an assortment of software titles. The Hi-Val, Newcom, and Sony kits all use Sigma's Hollywood Plus MPEG-2 decoder board. (Hi-Val also offers a $428 version of its kit that lets you transmit video from your PC to a TV screen that's located elsewhere in the house.) ▶

Write On!

THOUGH DVD-ROM and CD-ROM are the most popular optical drive formats today, neither of them let you burn your own discs. If you need to back up data files, create distribution discs for your own software, make audio CDs, or copy CD-ROM discs, check out two writable formats: CD-Rewritable and DVD-RAM. Both formats are gaining presence in the marketplace, both let you read from and copy to optical discs, and both are great for making backups.



Still a CD World

BY FAR THE MORE MATURE and prevalent of the two drive formats, CD-RW makes the most sense if you want to distribute discs now. CD-RW drives sell for as little as $300 and let you burn both write-once CD-R discs and rewritable CD-RW optical discs. CD-R discs hold special appeal because they can cost as little as a buck apiece, and most PCs can read them. Rewritable CD-RW and DVD-RAM discs cost a lot more ($10 to $15, and $20 to $50, respectively), and you'd be hard put to find other machines they work in.

But a CD-RW drive isn't everybody's solution. These drives don't support the DVD-ROM format or play DVD games and movies. In addition, although they're fast readers, CD-RW drives are relatively slow writers: Copying a CD-ROM can tie up your PC anywhere from half an hour to half the afternoon. Even so, if you're interested mainly in creating your own discs, the slow writes won't cause much of a problem, and restoring data from a CD-RW backup is often faster than using a tape or Zip drive. But if you want to back up very large files or make an exact copy of your hard disk, you may be happier with a higher-capacity solution such as a tape backup drive or a DVD-RAM drive.

Since DVD-RAM's arrival last summer, it has offered many of the advantages of DVD-ROM, including the ability to run CD- and DVD-based software. It stores up to 2.6GB (296 minutes of audio) per side, more than four times the capacity of CD-R and CD-RW discs. These capabilities make DVD-RAM tempting for users who could really sop up the extra space, such as those who back up lots of data files or who want to create large multimedia files (training applications, say) with different languages and multiple views or camera angles. But get ready for sticker shock: These drives sell for a steep $500 to $1000.

DVD-RAM's main competitor, Sony's DVD+RW format, promises excellent backward compatibility with DVD-ROM drives, faster writing speeds than DVD-RAM, and up to 3GB of storage per side—slightly more space than DVD-RAM. The first DVD+RW drives are due out this summer; industry experts predict that prices for the drives and discs will be similar to those for DVD-RAM. But you won't be able to read a DVD-RAM disc on a DVD+RW drive, or vice versa. In addition to Sony, Hewlett-Packard, Mitsubishi, Philips, and Ricoh plan to ship DVD+RW drives.

DVD Will Dominate

RIGHT NOW CD-RW boasts the most talent: It's the only drive able to burn cheap CD-R discs that are readable by almost any PC. But if you want to perform big backups, have a big budget, and don't need to distribute discs, take a hard look at DVD-RAM. Which format will prevail? With demands for faster, higher-capacity drives growing every day, the eventual standard will almost certainly be based on DVD technology. For more information, see this month's *Top of the News.*

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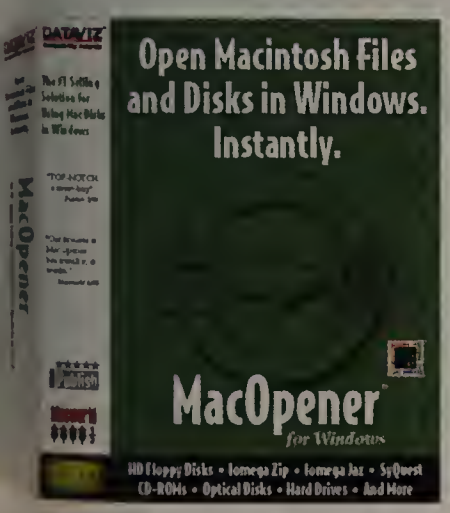

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The greatest variations among the kits are in their software bundles, and even here, the disparity is mostly in the games and entertainment titles. Of the kits, only Sony gives you anything you might find useful in an office: Funk & Wagnall's Unabridged Encyclopedia on CD-ROM.

Whether we viewed movies on a big-screen monitor or a TV set, the four kits that we managed to get working (all but the Pacific Digital) produced very similar, impressive images and sound. However, the Creative Labs kit, which uses a different MPEG-2 decoder board from the rest, generated slightly fuzzy images at smaller window sizes. On the other hand, we preferred Creative's on-screen DVD player, which resembles a VCR remote control and is instinctively easy to use. Sigma's software proved just as capable but makes you navigate too many menus. We sometimes struggled to find the right control for basic operations, such as setting the language or adjusting color contrast.

Our tests show that most shoppers need not worry about drive performance. All five DVD-ROM drives read CD-ROM discs at speeds similar to those of a standard CD-ROM drive, and we found only minor differences among them in DVD-ROM performance. Installation can be another story. Even if you consider yourself technically savvy, you should factor support quality into your buying decision, because getting these kits to work properly can be tricky. With most vendors, we endured long hold times, waited a long time for callbacks, and received only satisfactory support. Sony was the exception: We got an instant response almost every time.

Creative Labs

SURF'S UP: The PC-DVD Encore 5X is affordable at only $250, and Creative Labs did a great job of making the on-screen buttons look like a remote control. But if you have to call tech support, make sure you have a redial button.

INSTALLATION AGGRAVATIONS

IF YOU DECIDE TO GO with a DVD-ROM drive without an MPEG-2 board, take heart. Installing a drive by itself is so easy that even the most mechanically challenged will feel like an ace. Simply disconnect the power, data, and CD audio cables from your CD-ROM drive; swap the CD-ROM drive for the DVD-ROM drive; and reconnect the cables to the ▶

TEST REPORT

Hi-Val DVD Tops CD-ROMs at Their Game

But most users will see little speed difference between these drives in daily use.

	OPTICAL DRIVE	CD-ROM/DVD-ROM read speeds (vendor rating)	CD-ROM based application test times (Faster)	DVD-ROM based application test times (Faster)
DVD-ROM kits	1 Sony DDU-220E/H5X DVD-ROM*	24X/5X		
	2 Creative Labs PC-DVD Encore 5X	32X/5X		
	3 Hi-Val DVD-3	32X/4.8X		
	4 Newcom Cinema II Plus	20X/2X		
	5 Pacific Digital DVD 2X DVD-ROM	20X/4X		
Baseline drives	*Typical preinstalled CD-ROM drive*[1]	32X/–		n/a
	Typical preinstalled DVD-ROM drive[2]	32X/4.8X		
	Typical CD-RW drive[3]	24X/–		n/a

*Best Buy n/a = not applicable

Minutes 0 2 4 6 8 10 2 4 6 8

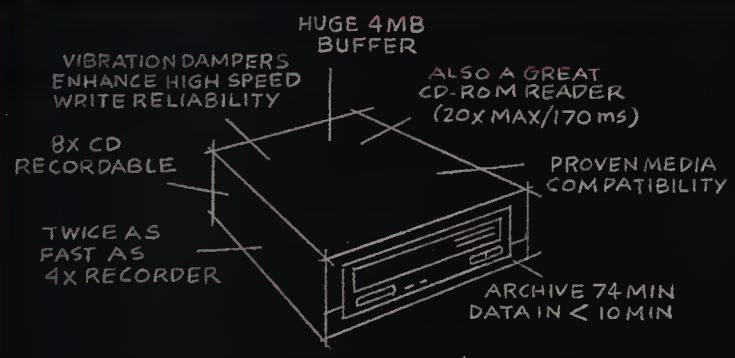
MS Office 97 Professional Install · DeLorme AAA Map'n'Go · PhoneDisc · Corel PhotoCD · PhoneDisc · DeLorme AAA Map'n'Go

TEST PC WORLD CENTER

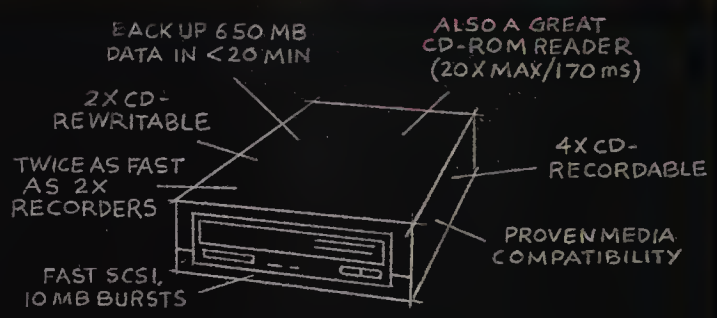
HOW WE TEST We tested the drives for disc read performance using a set of scripts of common tasks, four for CD-ROM reading and two for DVD-ROM reading tasks. We timed how long it took each drive to complete each script. For the CD-ROM tests, we tested how long it took to copy Microsoft Office Professional installation files, to create a cross-country trip route using DeLorme's AAA Map'n'Go program, to search the PhoneDisc disc for 47 phone numbers, and to display 100 photos from a Corel PhotoCD disc. For the DVD-ROM tests, we repeated the DeLorme and PhoneDisc tasks using the DVD-ROM version of these discs. We tested all drives under Windows 98 using a Dell Dimension Pentium II-333 adapter mini-tower equipped with 64MB of RAM, a 10GB hard drive, and integrated ATI Rage Pro 3D 2X AGP graphics. Data based on tests designed and conducted by the PC World Test Center. All rights reserved. [1]Average of times for Sony CDU-701 and Toshiba XM-6202B drives. [2]Average of times for Hitachi GD-2500 and Toshiba SD-M1202 drives. [3]Hewlett-Packard CD-Writer Plus 8110i.

PlexWriter 8/20 & PlexWriter RW 4/2/20

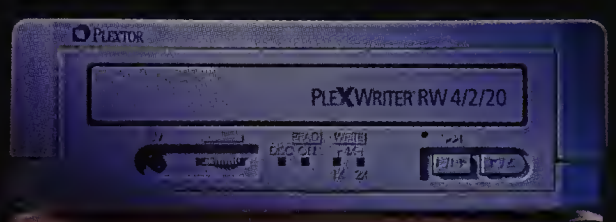
Write Like a Genius.



PLEXWRITER 8/20
CD-RECORDABLE DRIVE



PLEXWRITER RW 4/2/20
CD-REWRITABLE DRIVE



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PlexWriter 8/20 CD-Recordable Drive. With 8X write speed, 20X read speed and 170ms access time, it's twice as fast as any 4X recorder. Archive 74 minutes of data in under 10 minutes. You can even replace your old CD-ROM drive and get two drives in one.

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The PlexWriter 8/20 CD-R. Available late November 1998.

PlexWriter RW 4/2/20 CD-ReWritable Drive. Another high-performance first for Plextor. Now you can replace your 8X and under CD-ROM drive and get two drives performing three functions–all in one tough shell. With 4X write, 2X re-write, 20X read and 170ms access time, it's twice as fast as most 2X CD-RW drives. Back-up 650MB of data in under 20 minutes with drag and drop simplicity.

Fast SCSI burst rates and a 2MB buffer ensure read-and-write accuracy every time. Fool-proof media recognition automatically adjusts power and burn time–so you can write without failure. And bundled software supports CD to CD-R direct duping, digital audio capture/playback and HDD recovery from bootable CD.

The PlexWriter RW 4/2/20. Available after January 1, 1999.

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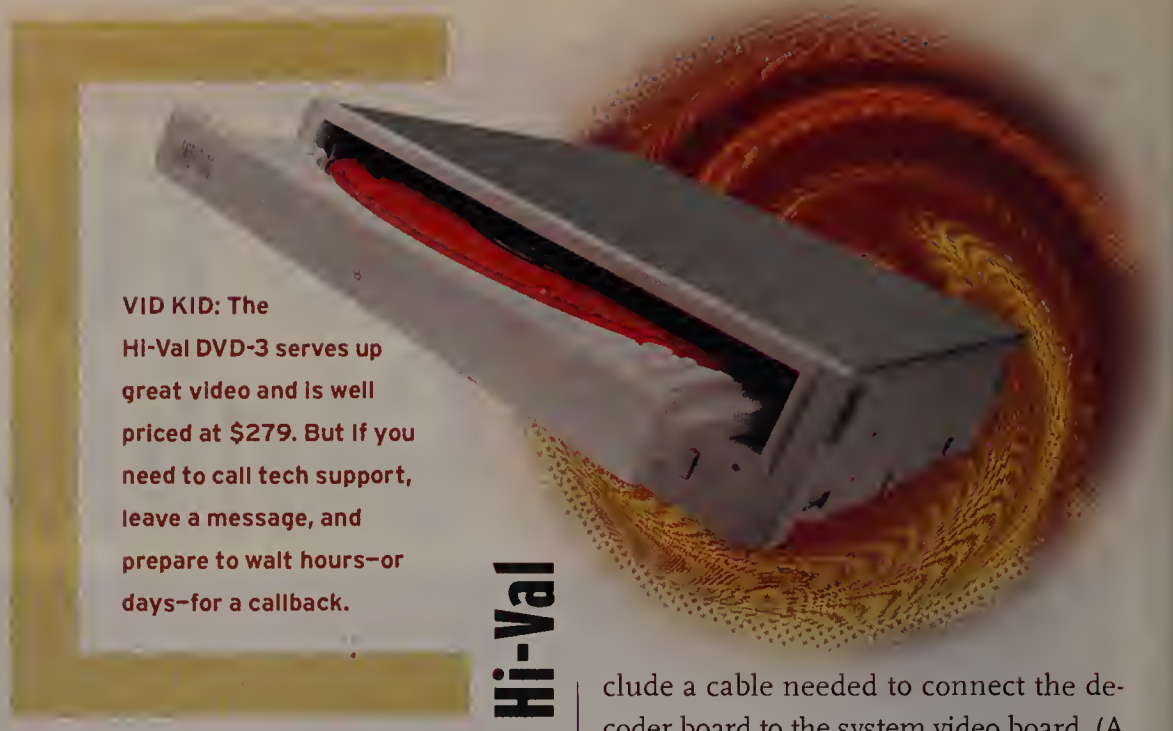
matching connectors. You may have to change the preset master-slave jumper on the new drive when you're first installing it. Otherwise, setting up your DVD-ROM drive is a breeze.

Installing MPEG-2 hardware decoder boards is another story. When you choose a kit, we strongly recommend you buy one backed by the best support available and a no-fee, unconditional money-back guarantee. For the most part, our installations went smoothly, but we tested the kits on a new Dell Dimension PII-333 with plenty of empty slots and two or three free hardware interrupts. In a more typical scenario, a *PC World* editor encountered so many problems trying to install the Hi-Val kit on his own Dell Dimension PII-300, his ten-day money-back period expired before he could get them resolved. In that instance, reps suggested a wide range of complex fixes, from upgrading the PC BIOS to upgrading the DVD-ROM drive BIOS, to swapping around IRQ and memory addresses manually. He never got the problem resolved. Vendors themselves confirm that your experience could be nasty: "Even people with engineering backgrounds have problems," said one vendor spokesperson. "It's supposed to be plug and play, but far too often it's plug and pray."

Of the kits tested for this review, Pacific Digital's gave us the most headaches. The company failed to include a cable needed to connect the decoder board to the system video board. (A not entirely helpful support rep told us to count the pins on our video feature connector and buy a cable at Radio Shack.) Pacific Digital includes a driver disc, but when the installation crashed, a different rep explained that some driver discs had been shipped without drivers. After we grabbed the drivers off the company's Web site, the player loaded, but it crashed again as soon as it tried to play a DVD ▶



VID KID: The Hi-Val DVD-3 serves up great video and is well priced at $279. But if you need to call tech support, leave a message, and prepare to wait hours—or days—for a callback.

Hi-Val

Decode **Softly** and Carry a **Big Chip**

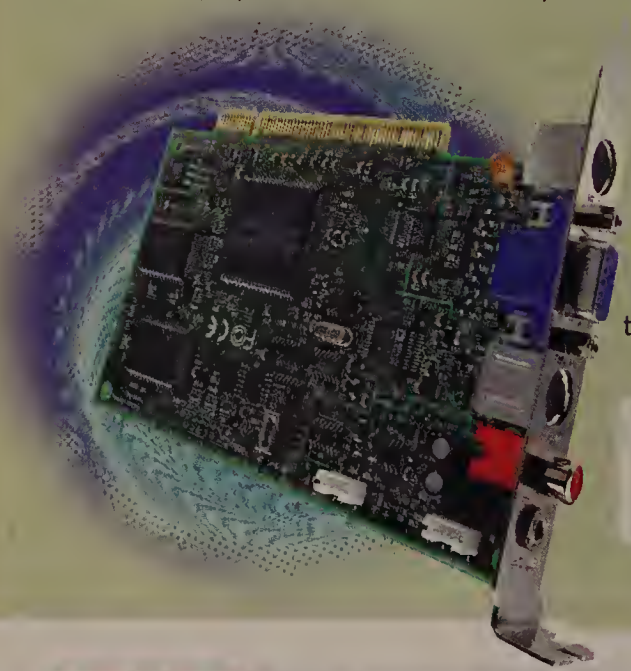
INDUSTRY HEAVY-HITTERS like Intel have long extolled the virtues of software DVD. But when we played movies through a software decoder, they stuttered, froze, and dropped frames while the CPU struggled to keep up. Now, finally, high-octane processors make watching movies on a PC through software DVD an enjoyable experience.

Software DVD MPEG-2 decoders, which include movie playback controls, offer many benefits. For starters, they're a lot cheaper than hardware decoders. Some vendors, like Dell, even include a software player gratis when you buy a new PC with a DVD-ROM drive. Better yet, software DVD spares you the installation woes associated with a decoder board. And if your PC has a fast CPU, a software decoder can work *better* than a board-based kit. Its main drawback: You may not be able to send decent DVD images to a TV screen. Most images from video boards with TV-out connections lack the crispness of video from a dedicated decoder board.

Many of the most popular movie playback utilities, including the one from Newcom that we tried, are based on Zoran's SoftDVD Navigator. We installed the software easily, and it worked perfectly from the get-go. Movies and games looked terrific on our Pentium II-333 system: no lost frames, distortions, or jaggy patches. To our eyes the image looked virtually identical to the one produced by Sigma's Hollywood Plus MPEG-2 decoder board, and the stereo sounded fine.

SoftDVD Navigator controls functions such as play, stop/pause, fast forward/rewind, and audio volume. In fact, some functions worked smoother on the Zoran player than on DVD kits we tested that use hardware decoders.

Bottom line: If you've got a high-end PC and don't need to display video from it on your TV screen, go for a software-only DVD solution. Software DVD costs less, is easier to set up, and—if you can supply the processing power—offers impressive image quality.



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	VisionMaster 502 (19.5" VIS)	TCO '95	0.27mm/dp	110khz	1800 x 1440@74hz	$999
	VisionMaster 501 (19.5" VIS)	TCO '95	0.27mm/dp	96khz	1600 x 1200@75hz	$939
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	VisionMaster 450 (18.0" VIS)	TCO '95	0.26mm/dp	102khz	1600 x 1200@80hz	$599
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	VisionMaster 400 (16.0" VIS)	TCO '95	0.26mm/dp	96khz	1600 x 1200@75hz	$438
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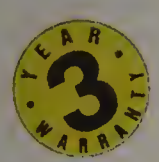

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VisionMaster Pro 17
April 1998, August 1998
VisionMaster 450

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disc. After two days of struggling, Pacific Digital's support department gave up, compelling us to do likewise. We ultimately tested the drive's performance without the decoder board installed. (A decoder board doesn't affect drive performance; it only decodes the MPEG-2 video that the PC reads off the disc.)

WHAT PERFORMANCE ANXIETY?

JUDGING BY THIS CROP of kits, optical-drive speed isn't an issue for most buyers. It's just as well, because vendors' speed ratings don't always match what you'll get. As long as the DVD-ROM drive is rated at 2X or higher for DVD, you'll be fine.

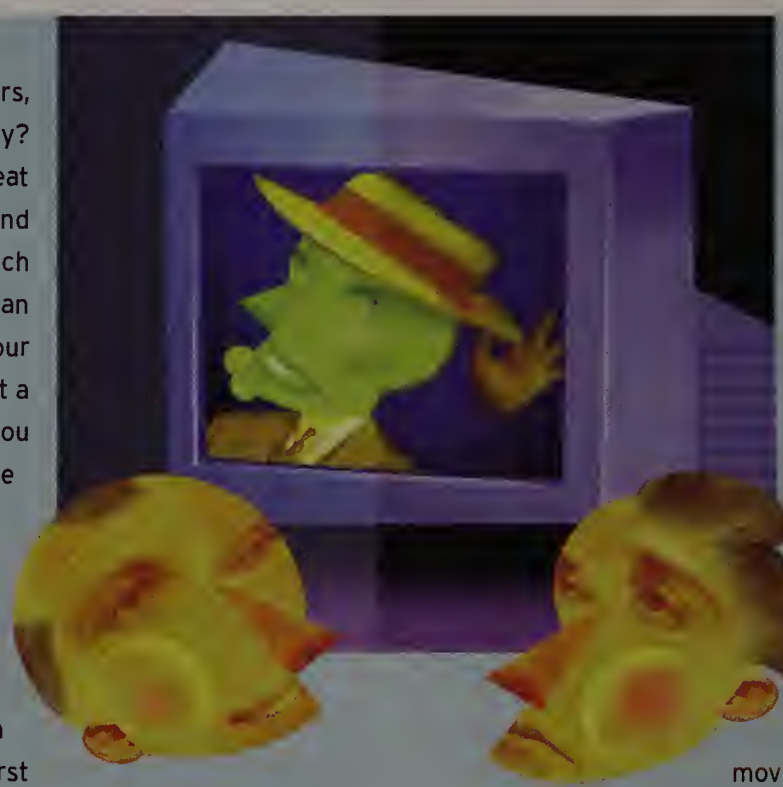
Most software titles ship on CD-ROM discs, so you need a DVD-ROM drive that measures up to standard CD-ROM performance. Not to worry: The most-common CD-ROM drives do perform slightly better than the DVD-ROM drives we tested (with the notable exception of the speedy Hi-Val), but the differences are too small for most people to notice. We also found no great differences in DVD-ROM performance among the kits.

In the CD-ROM realm, each *X* represents 150 kilobytes per second of data transfer from the disc; each DVD-ROM *X* equals 1350 KBps. In theory, the more *X* a drive offers, the faster it transfers data—but you'd never know it judging by the results of some of our real-world application tests. For example, the drives rated at 20X and 24X for reading CD-ROM discs generally outran Creative Labs' PC-DVD Encore 5X kit, rated at 32X.

To see how CD-ROM drives and DVD-ROM drives stack up against one another, we timed how long all the drives took to complete our CD-ROM application tests (we included times for our CD-RW and CD-ROM baseline units). We installed Microsoft Office 97 Professional, timed the creation of a cross-country trip using DeLorme AAA Map'n'Go, searched for phone numbers on PhoneDisc Power Finder, and ran a 100-photo slide show from Corel Photo-CD Labs 2.0. For the DVD-ROM drives, we repeated the PhoneDisc and AAA Map'n'Go benchmarks using these applications' DVD-ROM versions. ▶

Battle for the **Boob Tube**

YOUR VCR HAS been doing the job for years, but who doesn't want better video quality? Dedicated set-top DVD players provide great images and sound, but they cost $400 and up. What about a PC-based DVD kit, which promises the same video quality for less than half the cost? Hook up a few cables from your computer to your TV set, and you can start a collection of DVD movies with the $200 you save. And you get a nice PC upgrade in the bargain.



Tape Versus Disc

TO TEST THIS ALLURING scenario, we arranged a shoot-out between a VCR, a DVD player, and a DVD-ROM PC with a Sigma Hollywood Plus MPEG-2 board. First we threw some popcorn into the microwave. Then we dragged a small jury of *PC World* editors away from their deadlines and forced them to watch Jim Carrey's *The Mask* on a TV screen in three formats: VHS, DVD player, and PC-DVD. We compared sharpness, steadiness, color saturation, and ease of control.

The DVD player emerged the victor. Viewing a DVD film, regardless of the source, is vastly superior to watching it on a VCR. The VHS tape, fresh out of the shrink-wrap, still produced much fuzzier pictures than DVD.

To our surprise, the quality of the video reeling off the PC-DVD drive matched what we saw from the stand-alone player, except for a small band of jiggly video at the bottom of the frame. It was the humble remote control, however, that swayed us to the stand-alone player. The player comes with a remote, something we wished we had with the PC-based DVD-ROM unit—especially since our PC wasn't in the same room as our TV set. To take a break during the movie, we had to run into the den, hit the pause button, and rewind a little to make up for the time it took us to pause. When we were ready to resume watching, we had to go into the den again and then race back to the living room. We also found that switching video output between the PC monitor and the TV sometimes caused trouble. Occasionally we lost the DVD menu, menu choices quit working or disappeared, the PC's monitor went blank, or the PC crashed. Another time we had to reinitialize the Hollywood Plus player defaults. If you've got a roomful of kids waiting to see *Lion King*, this is not the way to run a movie theater.

TV Versus PC

IF YOU DON'T MIND watching movies on your PC's monitor, so much the better. DVD movies look great when played on a 17-inch monitor set for 1024 by 768 resolution, viewed from a distance of 5 or 6 feet. When you display DVD on a TV, you see scan lines, and tiny chromatic flaws where one bright color moves across another; the PC monitor displays a perfect image, much like a movie screen does. On the other hand, colors on the monitor appear paler than those on the TV. And of course, if you and your family prefer to sit more than 6 feet from the screen—say, on a sofa across the room from a bright, big-screen TV—your PC monitor can't compare.

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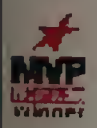

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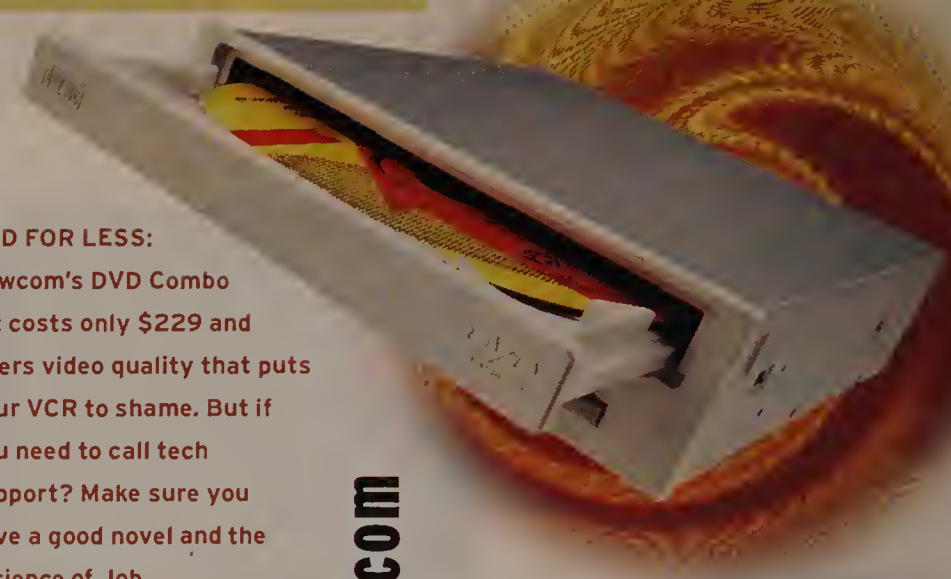
In the Photo-CD Labs and two Phone-Disc tests, all drives finished their tasks within a few seconds of one another. We found greater differences in the Office 97 installation tests: Creative Labs' drive took over a minute more than the average bundled CD-ROM drive to install Office 97. While this difference is noticeable, it usually doesn't matter. Most users spend very little time installing large applications.

We did see a big speed gap when plotting travel routes using the CD-ROM version of DeLorme's AAA Map'n'Go. If you use travel-routing software frequently, either stick with a fast CD-ROM drive or upgrade to the DVD version of this route planner. Using the CD-ROM disc, the Hi-Val DVD-ROM kit aced this test, plotting our route in a little less than 3 minutes; the average CD-ROM drive took a little under 4 minutes. Meanwhile, our Best Buy Sony DVD-ROM kit took almost 6.5 minutes to complete the same task. Using the DVD-ROM disc, however, the Sony drive finished the same task in only 48 seconds—the fastest time of all the drives that we tested.



Newcom

DVD FOR LESS: Newcom's DVD Combo Kit costs only $229 and offers video quality that puts your VCR to shame. But if you need to call tech support? Make sure you have a good novel and the patience of Job.

Pacific Digital

NIGHTMARE ON PC STREET: Pacific Digital's DVD 2X drive is a must-miss, at least for now. It failed to work even after we had scrounged key pieces that the kit lacked, and even after we spent hours on the phone with tech support.

OPERATORS NOT STANDING BY

WE GOT THE DVD kits working without much hair-pulling, except for the Pacific Digital. But numerous factors affect how easy or hard it is to install decoder boards, including the video card you use and even the BIOS versions of the PC and DVD-ROM drive, so many users won't get off so lightly. Many of you will need support—and our own calls show most of you will have a tough time getting it.

The support *policies* look solid. Sony offers round-the-clock help, and all the companies but Pacific Digital provide at least some weekend hours. But looks can be deceiving: We called each firm at least twice and found that even the best support—Sony's—is far from ideal. In most cases, getting through to a live person was an ordeal. Even Sony, which answered all our calls instantly, accidentally dropped us once and never called back.

Still, that's better than our experiences with Sony's competitors. When we called Hi-Val's support, we always had to leave a message, even during standard business hours. The first time, a rep called us back 2 hours later; our next call was returned after 7 hours. We fared worse with Creative Labs: After many busy signals, we finally got a voice-mail menu that kept us on hold for 16 minutes before a rep picked up. Newcom was worse still: After three calls, one disconnect, and nearly an hour and a half on hold, we got voice mail telling us to leave a message. We finally heard back from tech support the next day.

Almost all the technicians we spoke with were courteous, but some of them provided little or no help. The Sony, Creative Labs, and Hi-Val people were on the money every time; Newcom's reps were right once, wrong once. Pacific Digital's support technicians spent two days trying to help us get the decoder board working before they finally gave up, muttering vaguely about undocumented Windows error messages and incompatibility issues with our video board.

BUY NOW, PLAY LATER

WHEN YOU GET DOWN TO IT, few people really *need* a DVD-ROM drive—yet. But if you're buying a new PC or have to replace your CD-ROM drive, DVD-ROM's appeal grows stronger by the day, thanks to dropping prices and the imminent arrival of more business-oriented DVD titles. And if DVD games and movies make your heart beat faster, so much the better. Many people today routinely pop audio CDs into their PCs. Before too long, you may be doing the very same thing with your favorite movie.

Michael Goodwin is a frequent contributor to PC World *and specializes in writing about desktop and notebook computers. Applications-based performance tests conducted by Mike Salayko of the PC World Test Center.* ■

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Let's face it, most scanners are not as simple as they are supposed to be.

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- Iomega Zip Drive $99[6]
- Upgrade to Altec Lansing 3-Piece Speakers $85[6]
- 3Com 10/100 TX NIC $65[6]
- Upgrade to Microsoft® Windows NT® $99[6]

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	Prosignia Desktop 310		Prosignia Desktop 330		
Processor	Intel® Celeron® 300A/66MHz	Intel Celeron 333/66MHz	Intel Pentium® II 350/100MHz	Intel Pentium II 400/100MHz	Intel Pentium II 450/100MHz
Cache	128KB integrated	128KB integrated	512KB L2	512KB L2	512KB L2
Memory	32MB SDRAM	64MB SDRAM	64MB SDRAM	128MB SDRAM	128MB SDRAM
Hard Drive	8.4GB	8.4GB	10GB	13.5GB	16.8GB
CD-/DVD-RDM	40X[1] Max CD-ROM (optional upgrade to DVD-ROM available on some models)				
Modem	Compaq 56K V.90 data/fax modem[2]				
Video Card/Memory	Matrox G100 AGP/4MB	Matrox G100 AGP/4MB	Matrox G200 SD AGP/8MB	Matrox G200 SD AGP/8MB	Matrox G200 SD AGP/8MB
Total Slots/Bays	6/5	6/5	6/5	6/5	6/5
Compaq Color Monitor[3]	S700 17" (15.7" viewable)	S700 17" (15.7" viewable)	S700 17" (15.7" viewable)	S700 17" (15.7" viewable)	S700 17" (15.7" viewable)
Diskette Drive	3.5" 1.44MB	3.5" 1.44MB	3.5" 1.44MB	3.5" 1.44MB	3.5" 1.44MB
Ports	ECP Parallel, Keyboard, 2 Serial, 2 USB, Mouse				
Keyboard/Mouse	104-key/Compaq Microsoft® Intellimouse™				
Audio/Speakers	Compaq PremierSound/2-Piece Speakers				
Pre-installed Operating System	Microsoft Windows® 98	Microsoft Windows 98	Microsoft Windows 98	Microsoft Windows 98	Microsoft Windows 98
Productivity Suite	Microsoft Office Small Business Edition V2 (Optional Microsoft OfficePro97 available), Training Program for Microsoft Office, Norton AntiVirus, and Carbon Copy Host				
Online Services[4]	Free[4] trial of Compaq Online Services				
Limited Warranty[5]	3-Year	3-Year	3-Year	3-Year	3-Year
New Low Prices[3]:	**$1,279[6]**	**$1,399[6]**	**$1,599[6]**	**$1,849[6]**	**$2,099[6]**
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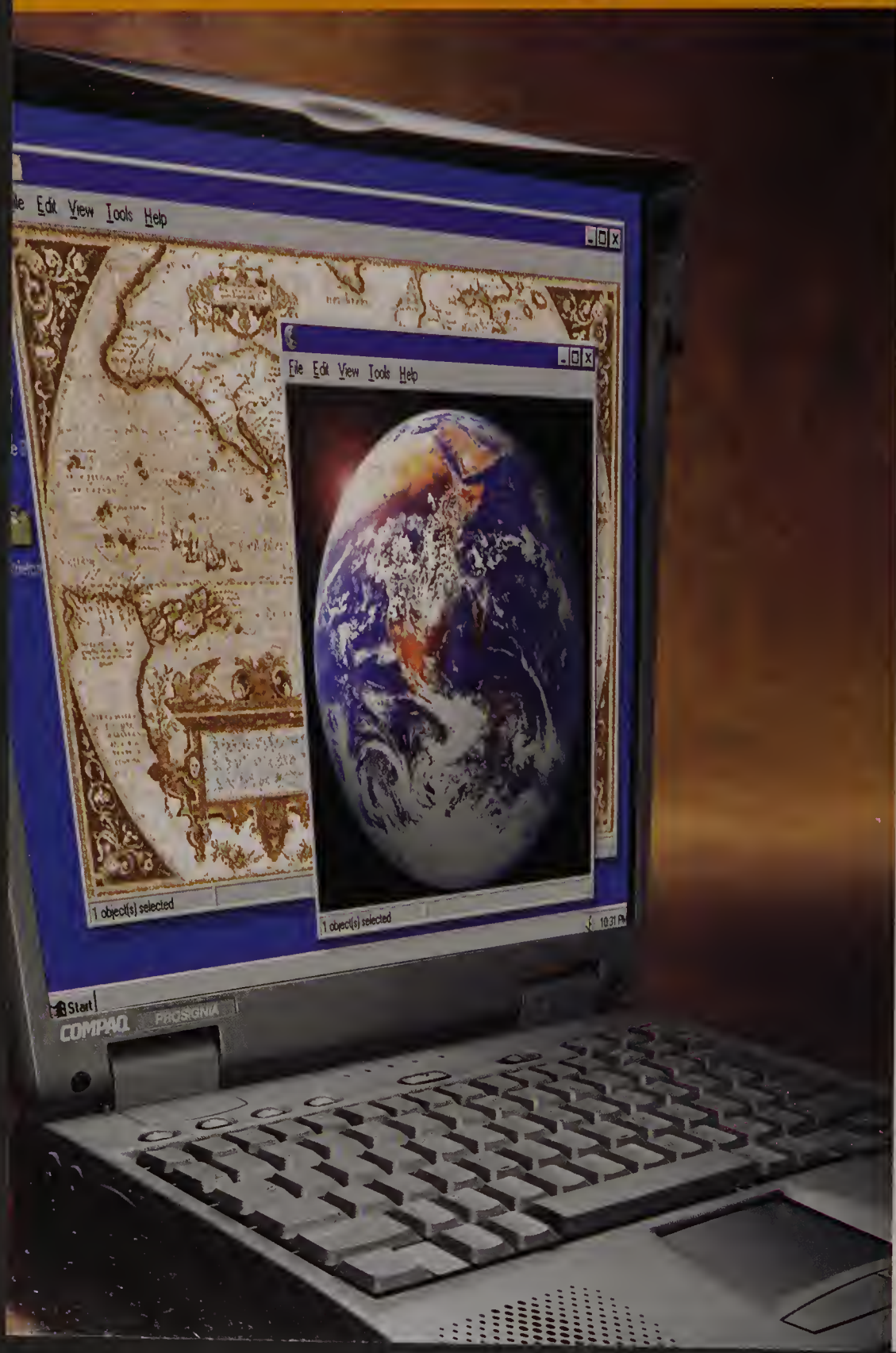
Prosignia *Notebooks*



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Consider these upgrades:

- Convenience Base (Pass-Through) $189[6]
- 64MB to 96MB Memory $65[6]
- 24X[9] Max CD to DVD Drive $199[6]
- Additional Li-Ion Battery $129[6]
- Compaq Value Carrying Case $49[6]

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	Prosignia Notebook 120	Prosignia Notebook 140	Prosignia Notebook 160
Processor	Mobile Intel® Pentium® II 233MHz	Mobile Intel Pentium II 266MHz	Mobile Intel Pentium II 300MHz
L2 Cache	512KB	512KB	512KB
Memory Std./Max.	64MB/160MB	64MB/160MB	64MB/160MB
SMART Hard Drive Std.	4GB	4GB	6GB
Display	12.1" SVGA CTFT (800 x 600)	13.3" CTFT (1024 x 768)	14.1" CTFT (1024 x 768)
CD-ROM/Diskette Drive	24X[9] Max/3.5" 1.44MB	24X[9] Max/3.5" 1.44MB	24X[9] Max/3.5" 1.44MB
Integrated Modem	Compaq 56K V.90 data/fax modem[2]	Compaq 56K V.90 data/fax modem[2]	Compaq 56K V.90 data/fax modem[2]
Battery Type/Life[10]	Li-Ion (up to 5 hours with the second battery installed)		
AC Adapter	Integrated	Integrated	Integrated
MultiBay	Supports one of these integrated components: Iomega Zip Plus, SuperDisk LS-120 Drive, 3.5" 1.44MB diskette drive, second hard drive or second battery		
PC Card Slots	2 Type II or 1 Type III	2 Type II or 1 Type III	2 Type II or 1 Type III
Sound	Compaq PremierSound	Compaq PremierSound	Compaq PremierSound
Pointing Device	Touchpad	Touchpad	Touchpad
One-Touch Internet Access Button	Yes	Yes	Yes
Ports	Enhanced Parallel, Serial, External Monitor, External Keyboard/Pointing Device, Convenience Base, Headphone/Line In, Microphone/Line In, AC Power, RJ11, Infrared, USB		
Intelligent Manageability	Included	Included	Included
Pre-installed Operating System	Microsoft Windows 98	Microsoft Windows 98	Microsoft Windows 98
Productivity Suite	Microsoft Office Small Business Edition V2 (Optional Microsoft OfficePro97 available), Training Program for Microsoft Office, Norton AntiVirus, and Carbon Copy Host		
Online Services[4]	Free[4] trial of Compaq Online Services		
Dimensions	2.3" x 12.5" x 9.9"	2.3" x 12.5" x 9.9"	2.3" x 12.5" x 9.9"
Worldwide Limited Warranty[5]	3-Year	3-Year	3-Year
New Low Prices:	**$1,999[6]**	**$2,399[6]**	**$2,899[6]**
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- 64MB SDRAM Memory Kit $228[6]
- SMART 2SL Array Controller $697[6]
- Additional 9.1GB Wide-Ultra SCSI-3 Hard Drive $681[6]
- 4/8GB DAT Tape Drive $714[6]
- 56K[2] ISA Fax Modem $125[6]

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Choose one of these recommended configurations. Or customize a Prosignia to meet your specific needs.

	Prosignia Server 720	Prosignia Server 740	Prosignia Server 740
Processor	Intel® Pentium® II 400MHz	Intel Pentium II 400MHz	Intel Pentium II 450MHz
Dual Processor Support	No	Yes	Yes
L2 Cache	512KB	512KB	512KB
Memory Std./Max.	64MB/384MB ECC SDRAM	64MB/1GB ECC SDRAM	128MB/1GB ECC SDRAM
SCSI Hard Drive	4.3GB	9.1GB	Two 9.1GB Drives (18.2GB Total)
Hard Disk Controller	Wide Ultra2 SCSI	Integrated Wide-Ultra SCSI-3	Integrated Wide-Ultra SCSI-3
Expansion Bays	5 Total: 3 Removable, 2 Hard Drive	8 Total: 4 Removable, 4 Hard Drive	8 Total: 4 Removable, 4 Hard Drive
Max Internal Storage	27.3GB	54.6GB	54.6GB
CD-ROM	32X[11] Max	32X[11] Max	32X[11] Max
Diskette Drive	3.5" 1.44 MB	3.5" 1.44 MB	3.5" 1.44 MB
Total Expansion Slots	6 (3 PCI, 1 PCI/ISA, 1 ISA, 1 AGP)	6 (2 PCI, 4 PCI/ISA)	6 (2 PCI, 4 PCI/ISA)
Network Interface Controller	Integrated 10/100 TX UTP	Integrated 10/100 TX UTP	Integrated 10/100 TX UTP
Redundant NIC Support	No	Yes	Yes
Software Setup	SmartStart	SmartStart	SmartStart
Server Management	Compaq Insight Manager, Automatic Server Recovery	Compaq Insight Manager, Automatic Server Recovery-2, Integrated Remote Console	Compaq Insight Manager, Automatic Server Recovery-2, Integrated Remote Console
Power Supply	200W	325W	325W
Compaq Monitor[3]	V55 15" (13.7" viewable)	V55 15" (13.7" viewable)	V55 15" (13.7" viewable)
Worldwide Limited Warranty[5]	3-Year	3-Year	3-Year
Pre-Failure Warranty[13]	Processor, Hard Drive	Processor, Memory, Hard Drive	Processor, Memory, Hard Drive
New Low Prices[3]:	**$2,319**[6]	**$2,949**[6]	**$4,199**[6]
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[1]**40X Max CD-ROM:** Data transfer rates may vary from 150KB/s to 6000KB/s. [2]**56K Protocol:** Designed to allow faster downloads from 56K-compliant digital sources. Maximum achievable download transmission rates currently do not reach 56Kbps and will vary with line conditions. Your modem may only download at the current V.34 standard protocol rates (up to 33.6K) until V.90 ITU standard software upgrade is available. [3]**Monitor included in price.** [4]**Compaq Online Services:** Free trial requires Internet access capability. [5]**Limited Warranty:** Ask for a copy of the limited warranty for any product featured in this catalog or call for details. Certain restrictions and exclusions apply. All warranty periods represent time from initial purchase. Battery packs and certain options are covered by a one-year limited warranty. Standard coverage includes: Compaq Prosignia Desktops 3 years parts, 1st year on-site labor. Warranty service for parts years 2 and 3 is provided via carry-in service. Compaq Prosignia Notebooks 3 years parts and 1 year labor; 48-hour turnaround on mail-in depot repair. If your notebook requires repair while under 1st year of warranty, Compaq will supply packaging, pick up the PC at your location, repair it, and return it to you. For pick-up service, call Compaq Tech Support Center. Warranty service for parts after 1st year is provided via carry-in or mail-in. For carry-in service you may bring the PC in to any authorized Compaq Service Provider. Compaq monitors S700 and S900 — 3 years parts with the 1st year on-site labor. V55 — 1 year on-site labor which covers parts and labor. Compaq 48-Hour Monitor Swap — if your Compaq S700 or S900 monitor needs servicing within the warranty period, you can get a replacement monitor from Compaq within 48 hours of your service call, however pick-up service is not available. Call 1-800-OK COMPAQ if you have a monitor problem. [6]All prices shown are DirectPlus prices and are subject to change, and do not include applicable state and local sales tax or shipping charges. [7]**Leasing:** Leasing available through Compaq Capital Corporation (CCC) to qualified commercial customers in the United States, subject to credit approval and execution of CCC lease documentation. Monthly lease payments are based on 36-month fair market value lease, and do not include taxes, fees, or shipping charges. Offering subject to other restrictions and CCC reserves the right to change, alter, or cancel at any time without notice. [8]Offer valid in U.S. only to end users. Expires 4/30/99. Limit one per customer and may not be combined with any other offer. Bundle and hardware must be leased at the same time. Proof of purchase must be submitted with rebate coupon. Invoice must show lease of product and Premier Online Services Bundle, date, Compaq hardware serial number, and end user customer name and address. Multiple addresses and P.O. boxes are prohibited. For complete rules, see rebate coupon that comes with lease paperwork. [9]**24X Max CD-ROM:** Data transfer rates range from 150KB/s to 3600KB/s. [10]**Battery Life:** Actual results may vary with individual usage. When tested in standard configuration, using the Ziff-Davis Battery Mark Test version 2.0, the battery life of the Prosignia Notebook will range up to 2.5 hours, standard configuration at the time of announce is considered to be one battery, 1024 x 768 (16-bit color) panel set at 50% brightness, 32MB RAM, and no drives active other than the hard drive. [11]**32X Max CD-ROM:** Data transfer rates vary from 150KB/s to 4800KB/s. [12]For hard drives, GB=billion bytes. [13]**Compaq Server Pre-Failure Warranty:** Pre-Failure Warranty is available on all Compaq Prosignia servers using Compaq Insight Manager 2.1 or higher, also covers ECC memory, and server hard drives (except the 535MB Fast-SCSI-2 hard drives) using Compaq IDA, IDA-2, Compaq SMART SCSI Array Controllers, Compaq SMART-2 SCSI Array Controllers, or SMART Array 3100ES Controllers. Products, specifications, and prices are subject to change. Compaq is not liable for pictorial or typographical errors in this catalog. Compaq, the Compaq Logo, Prosignia, Compaq Insight Manager, and SmartStart are registered with the U.S. Patent and Trademark Office. DirectPlus is a registered service mark of Compaq Computer Corporation. MultiBay and PremierSound are trademarks of Compaq Computer Corporation. Microsoft, Windows, and Windows NT are registered trademarks of Microsoft Corporation. Intel, the Intel Inside Logo, Pentium, and Celeron are registered trademarks of Intel Corporation in the U.S. and other countries. Other product names mentioned herein may be trademarks or registered trademarks of their respective companies. © 1998 Compaq Computer Corporation. All Rights Reserved.
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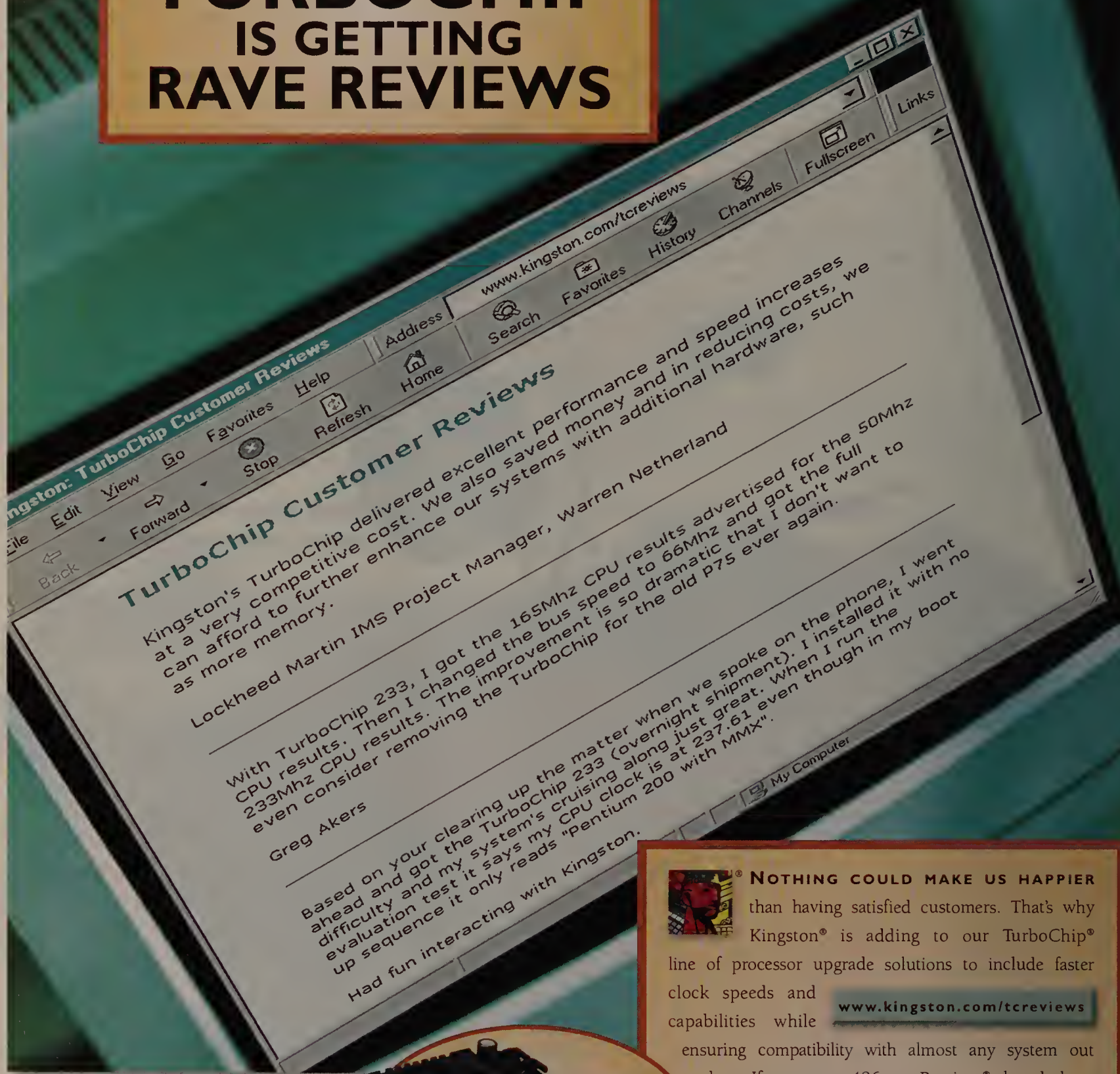

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ILLUSTRATIONS BY PAMELA HOBBS

DON'T GET STUCK WITH PHOTOGRAPHS YOU HATE. WITH ONE OF THESE NINE PHOTO EDITORS, YOUR IMAGES CAN BE JUST THE WAY YOU PICTURED THEM.

BY JOANNE ROBB

ALMOST EVERY PHOTOGRAPH can benefit from a quick fix. If your company's CEO has bags under his eyes, you can make him look more alert before you pop his image onto the Web site. If an overexposed photograph makes your home's paint job appear washed out, you can tweak its brightness before you print the real estate brochure.

Thanks to photo-editing software, you don't have to hire a graphic designer to make simple changes to a photo; now you can fine-tune images to your liking. But the range of features each tool offers (and the quality of the finished product) can vary widely, and there's no fair way to compare the simplest applications with office-oriented tools. So we looked at nine programs—from basic packages designed for non–graphics pros who occasionally need to touch up digital photos, to high-end designer tools with additional features that cost far more—and we awarded two Best Buys: one for the top basic-level tool, and another for the program that offers practically every feature an intermediate user would want, for a great price.

Each application underwent the same testing. Here we categorize each program by how well it performed the tests, how much hand-holding it does, and how much control it offers. We classify seven products as basic-level tools: They offer a simple, friendly interface and wizards to guide users through a touch-up process, but they may not be able to perform some tasks. The other two—Jasc's Paint Shop Pro 5 and Ulead's PhotoImpact 4.2—are intermediate packages; they're designed for experienced image manipulators who would rather have a finer level of manual control than wizard-based automation.

OUR BEST BUYS

FOR BASIC IMAGE EDITING, we recommend Microsoft's $49 Picture It 99. Its numerous how-to wizards not only assist in the completion of tasks but also educate users about the process of basic photo editing. Picture It's bargain-basement price and ease of use compensate for its inability to perform some tasks in our advanced tests.

Intermediate users willing to trade hand-holding wizards for finer control will appreciate the $79 Paint Shop Pro 5 application from Jasc. This useful tool easily completed all our tests, and it offers the intermediate user a wide variety of design features that go well beyond simple photo cleanup.

If you need (and can afford) more than these packages provide, take a look at "Kings of the Hill: Pro-Level Tools" on page 174 for evaluations of three advanced utilities that are appropriate for graphic designers.

CHEAP DOESN'T EQUAL EASY

THE GOOD NEWS FOR small-office and home-office users: None of the programs we evaluated will set you back more than 100 bucks. Adobe PhotoDeluxe Business Edition and Ulead's PhotoImpact 4.2 top the price list at $99 and $100, respectively. At the low end, The Learning Company's PhotoFinish 4.1, which costs a mere $40, is the cheapest of the bunch.

But price is a poor indicator of a tool's abilities. The $49 Picture It 99 earns a Best Buy, while MetaCreations' $44 Kai's Photo Soap is one of the toughest programs to use. Photo Soap's deceptively beautiful interface can (initially) distract you from the fact that most of its slider controls have no identifying text or tool tips; finding the desired control involves a lot of trial-and-error. (MetaCreations says that an upgrade to fix some of Photo Soap's deficiencies should be available soon after you read this.)

Adobe PhotoDeluxe is a remarkably versatile tool for basic photo editing that also

PHOTO-EDITING SOFTWARE FEATURES COMPARISON

PHOTO EDITOR	Street price (11/23/98)	Comments	Overall usability	Beginning tasks	Intermediate tasks	Advanced tasks	Hard disk space required (MB) [1]	PC World InfoNet number [2]
Adobe PhotoDeluxe Business Edition 800/833-6687 www.adobe.com	$99	Project-oriented templates and rich feature set; counterintuitive interface.	good	good	very good	good	16	750
Corel Photo House 2.1 [3] 800/772-6735 www.corel.com	$69	Better at advanced tasks than basic ones; suite includes templates.	very good	fair	good	very good	26 [4]	751
Jasc Paint Shop Pro 5 800/622-2793 www.jasc.com	$79	Excellent program performed every task well; solid documentation.	very good	excellent	very good	very good	32	752
The Learning Company PhotoFinish 4.1 800/716-8506 www.learningco.com	$40	Fairly good performance, but needs a better manual and better online help.	very good	good	good	good	10	753
LivePix LivePix Soho 800/724-7900 www.livepix.com	$50	Missing some key functions, like the ability to convert an image to a GIF file.	good	good	fair	fair	45	754
MetaCreations Kai's Photo Soap 800/846-0111 www.metacreations.com	$44	Though its unique interface is beautiful, Kai's tool proves much too difficult.	poor	fair	good	fair	20	755
MGI PhotoSuite 8.0 888/644-7638 www.mgisoft.com	$49	Easily completes many tasks, but it's tougher than most to use.	fair	very good	fair	good	32	756
Microsoft Picture It 99 800/426-9400 www.microsoft.com	$49	Full-featured tool for beginners; doesn't perform high-level tasks equally well.	excellent	very good	very good	fair	90	757
Ulead PhotoImpact 4.2 800/858-5323 www.ulead.com	$100	Package offers many features but could use better help.	very good	very good	excellent	very good	120	758

Best Buy [1] For full installation. [2] For more information about all products in this article, select PC World InfoNet no. 911, or visit www.pcworld.com/infonet. [3] Part of Corel Print Office. [4] Entire suite requires 62MB.

contains a significant amount of built-in wizard assistance. The package is relatively expensive at $99, but PhotoDeluxe handily completed our range of basic and intermediate tasks, and it also includes templates that allow you to tackle common design projects like creating business cards and brochures.

But despite Adobe's years as the leading maker of photo-editing software, we found that unless you rely heavily on its wizards, PhotoDeluxe is not very easy to use. Most of its powerful tools are fairly well hidden within layers of menus. On the other hand, Jasc's $79 Paint Shop Pro 5 includes comprehensive documentation that shows you how to get to every tool. And Microsoft's Picture It 99 uses a practically idiotproof interface to point you to tools that are every bit as full featured as those in PhotoDeluxe. Other basic-level products made certain tasks easier, but Picture It performed consistently well in all our tests—and it costs about half as much as PhotoDeluxe.

Adobe's product is one of several moderately priced applications that can perform more-advanced tasks. Corel's Photo House 2.1, Jasc's Paint Shop Pro 5, and Ulead's PhotoImpact 4.2 also give you freedom to grow. The Best Buy contest in the intermediate category was a fairly close call between Paint Shop Pro and PhotoImpact. A superior manual and somewhat better price earn Paint Shop Pro the intermediate user's Best Buy. PhotoImpact follows closely behind.

Casual Cleanups

FOR THE BASIC category, we evaluated how well each application performed a series of basic tasks on an image:

- adjusting brightness and contrast
- adjusting color saturation
- flipping an image along its horizontal axis to make a mirror image
- sharpening out-of-focus elements
- trimming an element out of the picture (making cutouts)
- converting a JPEG file to GIF format

MONET'S MIATA? With Microsoft's Picture It 99, you can add special effects (like this pointillist illusion) to make photos distinctive. Most programs we tested have similar effects.

Nearly every package we tested can finish simple tasks like these, though our tests show significant differences in the ability of basic-level programs to perform even the most elementary jobs. Jasc's Paint Shop Pro 5, our intermediate Best Buy, did the finest job, but among basic tools, Picture It did best consistently.

All the programs offer some level of automatic picture adjustment, but we found that most automated processes produced images that looked worse than the original. The automatic tool in Picture It yielded washed-out images, but you can customize its changes with sliders.

Jasc's Paint Shop Pro 5, MGI's PhotoSuite 8.0, and Ulead's PhotoImpact 4.2 all provide one feature we like—a thumbnail-image preview of your changes shown alongside the original image. By comparing pre- and post-change images side by side before you adopt the change, you can decide whether the modifications you're making to the image are excessive. Surprisingly, this convenient before-and-after comparison isn't a standard feature among low-end photo-editing tools. Picture It, for example, shows you a preview of the post-change photo but doesn't display the original.

All nine programs make short work of flipping the image horizontally. But PhotoDeluxe complicates the process a bit by placing its Flip Horizontal option in the ominous-sounding Advanced Tools section. And if you want to rotate a photo, you also have to root around in Advanced Tools instead of using PhotoDeluxe's intuitive Size/Orientation tool. Organizing basic tasks like these in the Advanced Tools category might discourage some beginners from trying them.

SHARPEN AND TRIM AND TRANSLATE—OH MY!

MOST PACKAGES' tools couldn't sharpen a specific area of a photo—they could only modify the entire image. Unfortunately, sharpening the whole photo often worsened the overall visual effect, by giving ▶

HOW WE TESTED IMAGE EDITORS

TO PUT EACH OF THE PROGRAMS through its paces, we shot task-specific digital photos with an Olympus D-500L digital camera set at 1024 by 768 pixels, the camera's highest possible resolution.

Our first series of tasks consisted of common jobs like adjusting the contrast and brightness of an image, and creating a mirror image. Our basic tests used a digital photo of a woman, taken in bright sunlight in front of a plain white wall. Intermediate tasks involved touching up blemishes in a photo of a car, and adding text along the bottom to create a for-sale flyer. Advanced tasks included removing the image of a palm frond from a photo of a building, pasting a resized cutout image of the woman from the first photo so she appears in front of the same building, blending the images together, and then optimizing the photo for Web publishing.

FAMILY RESEMBLANCE: We sharpened this image with Adobe's PhotoDeluxe (left) and Photoshop. PhotoDeluxe made the image look grainier and rougher than its more costly cousin did.

the image a rough, grainy character. Post-op pictures sometimes looked as if they had been rubbed against a stucco wall.

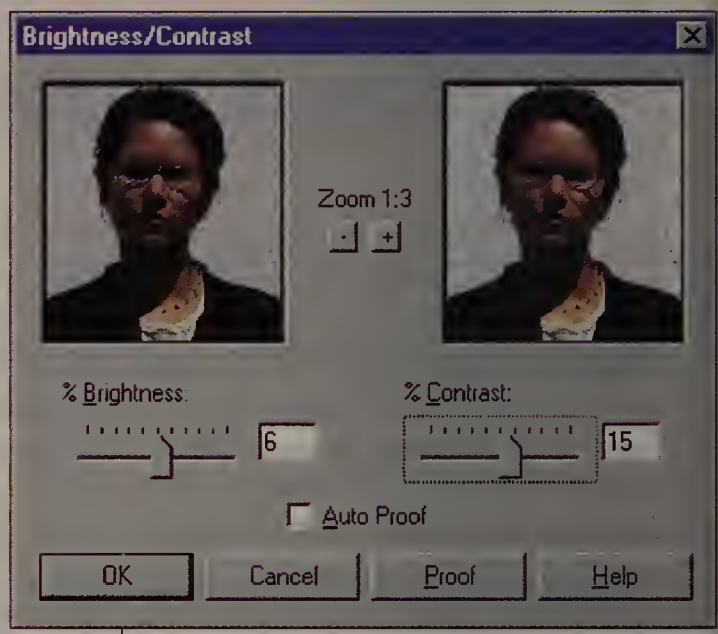
But that wasn't the case with either of our Best Buys. Picture It can sharpen images beyond the recommended range, but it doesn't make the whole image grainy—instead it leaves a hard, dark line around objects. Paint Shop Pro's sharpening tool works like a dream: Finished images look crisp, even when subjected to the highest sharpening setting.

Of the basic assignments we gave these programs, the task of performing cutouts proved the most challenging. Among lower-price programs, only MGI PhotoSuite and Picture It made managing cutouts easy: As you move the cursor around the image you want to cut out, the program deduces where you'll likely cut the image, and places an outline accordingly. Paint Shop Pro includes a Smart Edge tool that automatically molds itself to the outline of a figure as you click around it. (Higher-end products like Micrografx Picture Publisher and Adobe Photoshop 5 offer similar features; for more information, see "Kings of the Hill: Pro-Level Tools." In Photoshop's supremely simple solution, you just move your cursor around the figure—without clicking—and the program calculates the edge.)

The remaining tools use one of two cutout methods. With the "anchor" method, featured in LivePix Soho, Paint Shop Pro, PhotoDeluxe, and PhotoImpact, you click at points around the edge of the image, and the program adds adjustable anchors that let you create a clean, fine-tuned outline. A less-appealing method has you select a lasso (or outline) tool and then precisely drag a line around the object—a tedious, near-impossible mousing task with all but the most basic shapes.

Converting our test image into a GIF file tended to be a more straightforward task. GIF images are blessedly small, thanks to a relatively small palette of colors, and therefore load quickly, making the format a favorite of Web producers. Most programs handle this job exactly as we expected: Using the *Save As* menu item, you pick the file type you want from a list.

Some programs have features dedicated to fine-tuning files in a specific format. For example, PhotoImpact's Web SmartSaver converts files to GIF and other Web-based formats, and allows for all kinds of important color and file adjustments.



SEE THE FUTURE? Previews let you see the results of your changes—alongside the original photo—before you apply them.

A few programs make file conversion unnecessarily difficult. Saving a GIF file in Corel Photo House 2.1 requires you to drop the color palette manually down to 256 colors using Print Office (another program in the Corel suite); most programs perform this task automatically. If you need to do more editing, you have to reopen the image in Photo House—an annoying detour that Corel says will be unnecessary in the next version of the product, due out by the time you read this. And Metacreations' Kai's Photo Soap can't make the conversion at all without special plug-in software (MetaCreations says the capability will be integrated into an upcoming version).

HOW MUCH PHOTO EDITOR DO YOU NEED?

IF YOU...	YOU NEED...
need to perform minor touch-ups to photos, or want a tool that has templates for work projects like business cards	a simple program like Microsoft Picture It 99, Adobe PhotoDeluxe Business Edition, or Corel Photo House 2.1.
want a photo-editing tool that offers extensive control and functionality but doesn't require you to take a class to learn it	an intermediate program like Jasc Paint Shop Pro 5.
dream of artistic creation but have a limited budget to work with	a less-costly advanced program like Micrografx Picture Publisher 8.
have the eye of an artist and the wallet of a Rockefeller, or plan to create or edit high-end photos and graphic art	a super-advanced program like Adobe Photoshop 5.0.

Midrange Magic

OUR INTERMEDIATE-LEVEL touch-ups centered on a picture of a red sports car. Our test—preparing a for-sale ad flyer—required two steps:

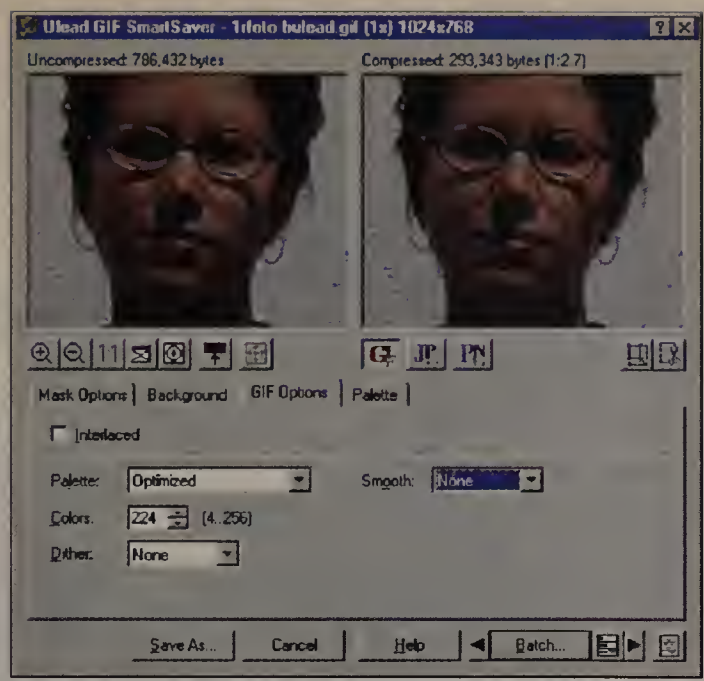
- removing visible evidence of the car's dings, dents, and scratches
- adding attractive "For Sale" text across the bottom of the photo

Though neither of these tasks is terribly complex, both take more photo-editing firepower than you might suppose. Most of the programs were equal to the occasion, but some offer the user substantially more control than others. Ulead's PhotoImpact took the crown in this category of tests.

PAINT MAGIC

EVER TRY MATCHING PAINT in real life? You think you've selected the right hue only to discover after it dries that it's just a shade off. Well, it's exponentially harder to match colors in a photo, mainly because there isn't just one color. The red of our test image's car, for example, actually consists of thousands of different shades that commingle on its surface, making it hard to select one color for fixes.

Fortunately, all the programs we looked at come with robust tools for repairing scratches on your photographs. Some packages, such as PhotoSuite and Photo House, can correct scratches and dents automatically, but manual tweaking produced better-looking results (as it did with their automatic contrast and brightness wizards). The custom tools fall into two general categories: touch-up and cloning.



BRAINY DIALOG: PhotoImpact's helpful SmartSaver helps optimize and compress GIF files for the Internet.

The touch-up tools allow you to choose a shade from somewhere on the photo—generally using an "eyedropper"—and then select another tool (such as a paintbrush) to place a droplet of that color in the right location. But unless the color that you designate with the eyedropper matches the surrounding area exactly, the repair will look like a large block of the same color—and be obvious to the eye. A smudge tool often works better on the more uniform areas of an image than the eyedropper does. Rather than selecting a specific color first, you use a smudge tool to wipe across the area you want to fix with a color from an adjacent part of the image, as if you were applying a damp sponge.

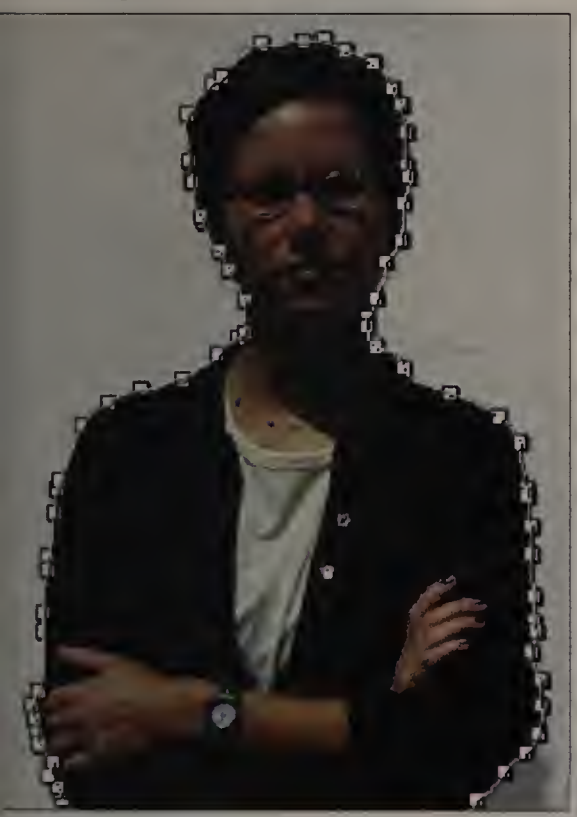
Paint Shop Pro's unique smudge tool lets you smudge with any color, whether it's adjacent or not, giving you increased control; most of the other utilities just pull the color from the pixels that surround the smudged area. And if you want to use the color that's right next to a fix-it spot in Paint Shop Pro, you can always select a pixel of color from the surrounding area with the eyedropper tool.

CLONING AROUND

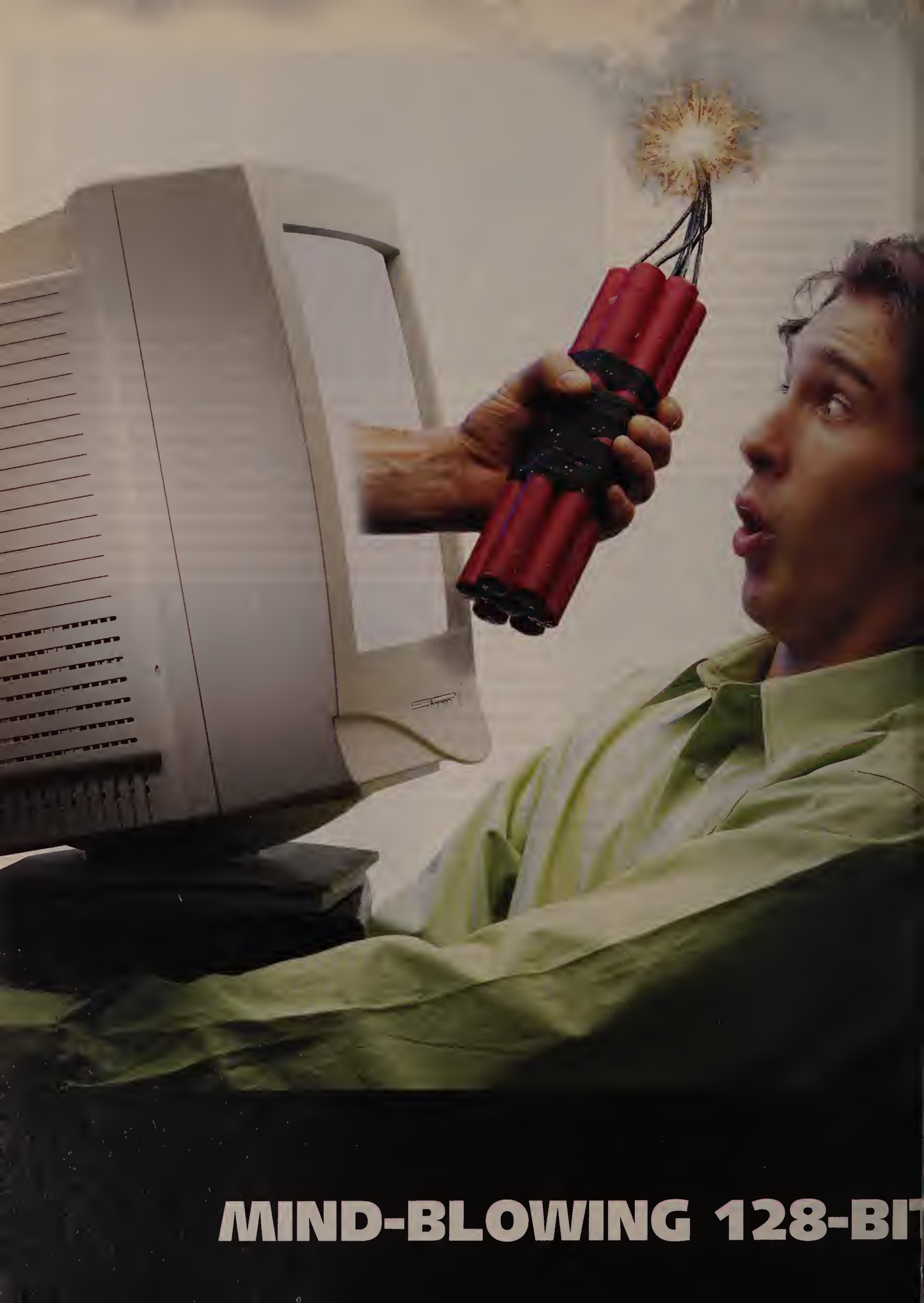
CLONING TOOLS let you select one section of a photo and copy it to other sections—a particularly handy option when a fix requires a range or gradation of colors. All cloning tools operate in much the same way: You set the cloning origin location, then paint a clone of that area in the destination. In our tests, we selected a part of the car that roughly matched the area near the scratch, cloned it, and painted the clone over the scratch. The best cloning tools—such as those in PhotoFinish, Paint Shop Pro, and PhotoImpact—allow you to change the size and shape of your brush to make detailed repairs.

TOUCH-UP TRICKERY: Picture Publisher lets you select a color from the image to touch up the digital paint job. But you may have some explaining to do when the buyer sees the real thing.

Some programs' touch-up tools are irksome. PhotoDeluxe, for example, requires you to navigate interminable menus to make each individual fix. LivePix Soho's troublesome cloning tool didn't always work as we expected: Sometimes the original cloned area maintained the proper relative distance from the destination, but often (and unpredictably) it would zoom off in a different direction, painting a black patch on our image's red car. ▶



ANCHORED HEAD: LivePix Soho's anchor points define a cutout. Even if your outline isn't perfect, you can just drag the anchors around until they're in position.



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GRAPHICS.

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The jury's still out on the superiority of cloning versus touch-up. Picture It includes two kinds of touch-up tools that, when used in combination, cleaned up our image with ease. The program's automatic touch-up function allows you to attempt a patch simply by clicking on the area that you want to fix; the program then estimates a correction. This feature makes acceptable fixes over large areas, but it encounters problems when it undertakes smaller types of touch-ups. For these more-exacting repairs, the Remove Scratch tool enables you to draw fine lines over parts of the image.

Nearly all of the programs include straightforward text tools: Click on the text button; enter your message; change the font style, size, and color; and voilà!—you're done. Some of the packages, however, present additional hurdles and oddities. In PhotoSuite, for example, you can't create text in the same window where you edit your photos; you have to make the change in the Project window—an unnecessary inconvenience. And you can't change the color of text in Paint Shop Pro once it has been added to the image. So choose wisely: If you pick the wrong text color, there's no going back.

KINGS OF THE HILL: PRO-LEVEL TOOLS

BESIDES EVALUATING tools that specifically target small-office and home-office users, we looked at three photo-editing and design applications intended for use by graphics professionals. Adobe Photoshop 5.0, Corel's Photo-Paint 8, and Micrografx's Picture Publisher 8 all work hard to woo design pros and technically adept hobbyists.

So what's the big difference between these Olympian rivals and their reasonably priced cousins? Not surprisingly, with advanced tools, ease of use often falls by the wayside. The pro applications offer several layers of menus that amount to literally hundreds of options. And while these packages permit an impressive number of adjustments, the programs seemed confusingly complex: Even when we were sure a photo editor could perform a specific function, we couldn't always figure out how to activate the feature. These packages also require a more solid understanding of the technical aspects of digital imaging and image editing.

If you plan to create high-end art and photographic images, Adobe Photoshop emerges as the clear winner in the features race. Even though we tested a relatively narrow range of photo-editing capabilities, it became clear that this package offers great depth: Leonardo would have been satisfied with the fine-tuning and tinkering it makes possible.

Even our most advanced photo-editing tasks didn't scratch the surface of the pro tools' capabilities: All three offer high-level image design functions, as well as features for touching up and manipulating pictures. But to compare these high-priced marvels of technology with their country cousins, we put them through the same trials.

SKIMMING THE BASICS

THE ADVANCED TOOLS sailed along where some SOHO tools could only dog-paddle. Every product we tested performed our basic tests, but Photoshop earned the best overall score here, including a perfect rating for its sharpening tool. Photoshop also has some automatic tools, but the custom tool is all you'll need. It brought our test image into focus without making it look too sharp or pixelated (photo-editing neophytes may find themselves clutching the manual as they make adjustments). One nuisance we noticed: Neither Photo-Paint nor Photoshop can save a photo as a GIF file until the program converts the image to an 8-bit color file, a task most other photo editors handle automatically.

MASTERS OF MANIPULATION

PHOTOSHOP AND Picture Publisher offer better cloning tools than our basic Best Buys; Photo-Paint, however, doesn't fare as well. Its clone tool appears straightforward, but resetting the target area proves more difficult than with the other programs. Picture Publisher lacks a feather feature, though you can simulate a degree of blur around the edge of the image by using a camera-aperture effect.

PRO PHOTO TWEAKING

ALL THREE UTILITIES completed the advanced tasks, but with varying degrees of ease. Both Photo-Paint and Photoshop offer a vignette effect similar to Picture It's soft-edge finish. Photo-Paint lets you change the shape of the border—to add an elliptical effect to a rectangular photo, for example. Picture Publisher offers somewhat less control over the final product but managed to produce a similar image in our testing.

TIME EXPOSED

IF YOU DECIDE to invest in a high-end photo editor, prepare yourself for an enormous hit to the wallet. Photoshop will set you back at least $650. And though Corel's and Micrografx's applications are less pricey, all three present a steeper learning curve than you'd experience with the other tools we tested. Don't expect to use any of these advanced programs effectively without training; more often than not, finishing a job requires a lot of know-how.

- **Adobe Photoshop 5;** street price $650; 800/492-3623; www.adobe.com

PC WORLD INFONET NO. 747

- **Corel Photo-Paint 8;** street price $329; 800/772-6735; www.corel.com

PC WORLD INFONET NO. 748

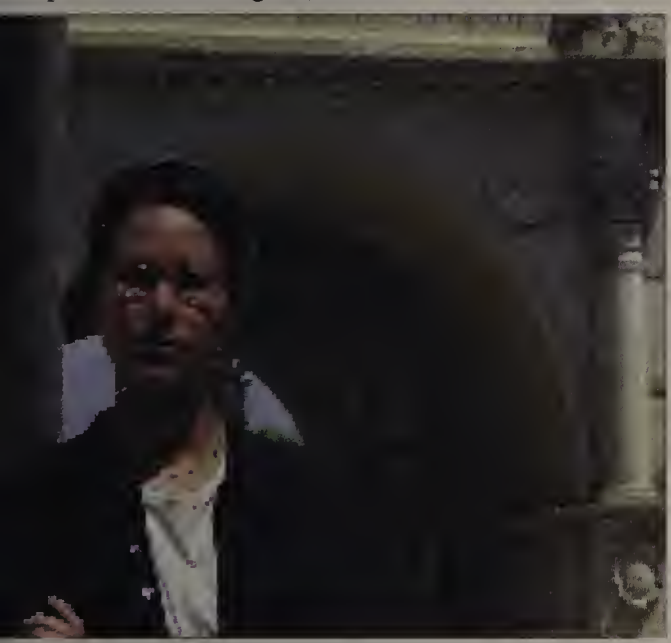
- **Micrografx Picture Publisher 8;** street price $150; 800/733-3729; www.micrografx.com

PC WORLD INFONET NO. 749

Advanced Projects

OUR ADVANCED TEST involved creating a photomontage of a woman in front of a building. Though no program won hands-down, Paint Shop Pro and PhotoImpact did the best job with the advanced tasks:

- removing a palm frond that obstructed the view of the building's clock tower
- using darkening and lightening tools to alter areas of the photo
- adding and resizing the image cut from another photo
- feathering the background of the image to create a sense of depth
- reducing the number of colors in a GIF image, permitting a smaller file
- altering the compression settings of the photo and saving in JPEG format



TEXTURE TRICK: To bring out some detail from the shadows, we used Paint Shop Pro's texture tool and painted the underside of the arch with large bricks.

LEAF BURNING, ARCH DODGING

REMOVING THE palm frond from our test image required tools and techniques similar to those we used to erase the dings in the car photo, but this task relied more heavily on cloning tools. The toughest part involved removing a blade of the palm frond that partly blocked the clock tower. Most of the frond hung against clear blue sky and was relatively easy to clean up.

But some of the leaf dangled in front of the building itself, blocking part of a narrow wrought-iron railing—a dramatically more complicated removal. Luckily, most of the cloning tools were up to the task, as long as we handled them with sufficient caution and precision. Picture It faltered a bit on this job: It cloned the leaf out of the picture, but it also altered the surrounding sky, which ended up a shade lighter than it should have been.

Darkening or lightening specific areas of the photo proved significantly more difficult for most of the programs. Neither LivePix Soho nor PhotoDeluxe was able to accomplish this task at all, though the other basic-level programs provided some way to lighten (dodge) or darken (burn) sections of an image. But our photo test required us to lighten the excessively shadowed archway of the building we photographed. None of the available methods were simple. In Photo House, for example, we selected the eraser tool and adjusted transparency settings so as not to erase too much color.

Paint Shop Pro has the best dodge tool of the bunch. In most of the other programs, adding light under the archway caused the whole area to appear smudged. But Paint Shop Pro lets you add light over a texture, much like making a rubbing of a name from a monument. We decided on the large-brick option as the image's texture—it's one of several dozen textures available in the Jasc package—and gave the building a realistic stone-block appearance.

With the exception of Kai's Photo Soap, every one of the programs capably added the cutout figure to the new image, but again with differing degrees of difficulty. Professional-level tools like Photoshop let you manipulate the edges of dropped-in images to help them blend more realistically with the background. Of the basic- and intermediate-level packages we examined, only PhotoSuite offers capabilities comparable to Photoshop's.

Our next task was to feather the background of the image—adding a textured edge so that the image would appear to have a border and some additional depth. The applications provided some interesting (and surprising) options for achieving the desired look. LivePix, Picture It, and Photo House are limited to creating a soft edge around the entire image, imparting the appearance of an old-fashioned vignette photo. Other programs approximate a real feathering effect: Kai's ▶

GOOD, BAD, AND UGLY TOUCH-UPS: Presented with a photo marred by an intrusive palm frond (top), Picture It fared poorly, leaving blocks of color in the sky and on the tower wall (middle). But Corel Photo House made the photo look almost as if the leaf had never existed.

Photo Soap, for example, includes a frame that adds a smoky black edge; and PhotoImpact offers a series of frames that have different border options.

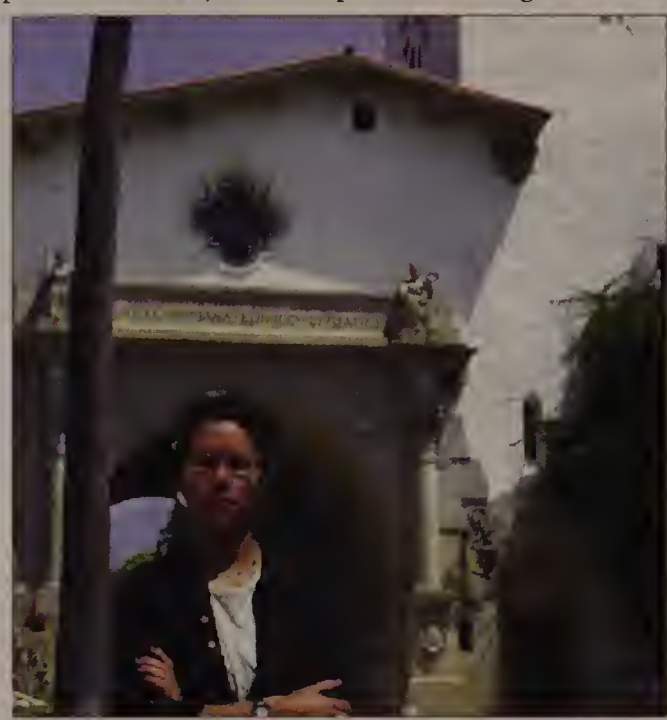
Three of the programs we looked at offer less-than-impressive feathering tools. PhotoFinish's effect simply didn't work at all, and PhotoSuite's process proved to be unnecessarily complex. The procedure consists of a frustrating four-step process. First you have to jump from the photo section of the program to the project section; next you're required to pull up a frame, add the frame, and finally send the rest of the photo behind the frame. Since a frame is essentially just the area surrounding the outer edge of an image, the designers of PhotoSuite could have programmed the frame so that it automatically sat on top of the image.

Even the versatile Paint Shop Pro photo editor could not easily create a feathered effect—a rather glaring weakness in this otherwise solid and straightforward program. Paint Shop Pro's convoluted, tiring process forces you first to painstakingly create a transparent feathered effect and then to choose a foreground color in order for the effect to appear on the image.

WORKING THE WEB

THE FINAL TWO TASKS of our test suite required the programs to optimize the color palette in a GIF file and change JPEG compression settings—both important capabilities for Web publishing.

Only three of the programs that we review here—Paint Shop Pro, Photo House, and PhotoImpact—provide users with a way to optimize color palettes. Oddly, though, this strictly-for-business tool lurks under the Fun Effects menu in Photo House. The precise tools in PhotoImpact enable you to specify the exact number of colors needed for optimum viewing. Although it includes a number of other high-level functions, Paint Shop Pro lacks palette optimization features.



BEYOND THE FRINGE: Adobe Photoshop (left) successfully masks the fringe effect, which in the LivePix Soho image gives our model the cutout quality of a paper doll. The white border in the LivePix picture is the giveaway.

Almost all the programs we looked at for this article let users tinker with JPEG compression and quality ratios. The exception is Picture It, which saves files in JPEG format but lacks custom settings.

CLOSING THE SHUTTER

MOST BASIC photo-editing programs handle the common tasks adequately. You can avoid the complexity and higher price of an advanced photo-editing application by sticking with tools that focus specifically on the jobs that most home or small-office users perform: adjusting contrast and color, and cropping images. These tasks demand only a basic-level program, especially if you lack an artist's ability.

But if you seek more control, invest in an intermediate-level photo editor. The affordable Paint Shop Pro can perform most standard business tasks well. On the other hand, if you're resolutely determined to use Photoshop for every job, prepare to spend a lot of money—and a lot of time—learning to use its high-end features.

JoAnne Robb is a freelance writer and editor based in Oakland, California. ■

TINKER TOOLS

OF THE DOZEN programs we tested, only Kai's Photo Soap is a one-trick pony—it only lets you touch up your photos, nothing more (and it doesn't even do that very well). The rest of the programs offer extra features ripe for the picking. Cool effects filters can change the entire look of your photo, giving it the appearance of an impressionist landscape, say, or dripping wet paint. Other tools can make your photo appear to be composed of a mosaic of smaller images, sketched in charcoal, or drawn on a wad of just-uncrumpled paper. Micrografx's Picture Publisher 8 stands out in the special effects ranks; its Effects Browser generates thumbnails of multiple effects in one window.

Advanced programs allow impressive control over effects. If you want to create a mosaic effect using Adobe Photoshop 5, for example, you can change not only the size of the tiles, but also the color and thickness of the grouting between them. But simple editing applications have some nifty extras as well. They include task-oriented project templates, notably lacking in the more-advanced programs. For example, Picture It offers templates for flyers and business cards and lets you mat your pictures, much as a frame shop would. Similarly, LivePix Soho, MGI PhotoSuite 8.0, Adobe PhotoDeluxe Business Edition, and Corel Photo House 2.1 feature business-oriented templates, generate on-the-fly slide shows, and can store images in searchable albums (which are useful for archives of related images).

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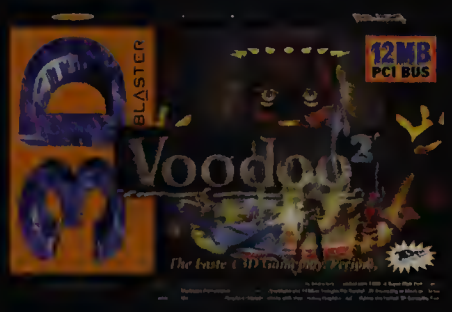

Its screaming speed comes from the 128-bit 3Dfx Voodoo Banshee™ processor, which includes a 3D engine based on the Voodoo2™. A full 16MB of 100MHz synchronous memory and a 250MHz RAMDAC give you ultra-high resolution and millions of colors. With DirectX®, Glide®, and 3Dfx OpenGL® drivers, tuned for compatibility with the widest range of applications and games, this affordable, easy-to-install graphics accelerator is a must for every PC. It's a gamer's dream come true and it doesn't break the bank!

Graphics Blaster® RIVA TNT™ delivers blood-curdling performance. It's packed with workstation power whether you're a hard-core gamer or a hot-shot 3D designer. An ultra-wide, 128-bit memory architecture synchronous memory supported by a TwiN-Texel, 32-bit color 2D/3D engine that has all the toys: bump mapping, multiple texturing, and even full-scene anti-aliasing. Whether you need to work with incredible precision or play games with liquid-smooth speed, Graphics Blaster® RIVA TNT™ is what you've been waiting for.

3D Blaster® Banshee features:

> Complete 2D/3D graphics solution based on the new Voodoo Banshee™ chipset from 3Dfx Interactive® > Features a full 128-bit graphics engine and Voodoo2™ 3D rendering technology > 16MB of SDRAM and 250MHz DAC deliver awe-inspiring resolutions, rock-solid refresh rates, and stunning visual quality > Boosts your PC's performance and provides compatibility with the widest range of applications and games in a single, cost effective upgrade

Graphics Blaster® RIVA TNT™ features:

> World-class 2D/3D, and video acceleration using the RIVA TNT™ processor from nVIDIA® > Ultra-wide, high speed 128-bit memory architecture and TwiN-Texel 3D pipeline deliver mind-numbing speed in virtually any application > 16MB 125MHz synchronous memory and a powerful 250MHz DAC provide incredibly high resolutions and refresh rates for brilliant, vivid images > Perfect platform for the power-user, gamer or graphic designer

www.soundblaster.com/experience/

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— PC Magazine, December 1998
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— PC Gamer, May 1998
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— C/NET, February 1998
5-Star Gameworthy Review,
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DeskTop Theater™ 5.1

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— PC Gamer, January 1999
DeskTop Theater™ 5.1

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GRAPHICS	> 3D Blaster® Banshee *(AGP & PCI)*	$99.99 *		◆	●	◆
	> Graphics Blaster® RIVA TNT™ *(AGP & PCI)*	$169.99		●	●	◆
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	> PC-DVD™ Encore Dxr™2	$229.99		●	●	◆
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◆ = best suited
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We put our money on the line and traded with eight Web brokerages.

Here are the best...no bull. *By Douglas Gerlach*

Trading Places

The Top Online Brokers

ILLUSTRATIONS BY RICCARDO STAMPATORI

Point, click, trade–

these three little words sum up the allure of online stockbrokers. Using nothing more than an Internet connection and an account with an online broker, you can buy and sell shares of stocks and mutual funds with mere keystrokes. No waiting to place an order with a brokerage house, no high commissions gobbling up big pieces of your nest egg.

Little wonder, then, that 6 million plucky investors have already exchanged the security of traditional brick-and-mortar brokerage houses for the promise of cheap, fast online transactions and reams of late-breaking information about the hottest properties on the market. But is the trade-off worth it?

ILLUSTRATION: RICCARDO STAMPATORI

UNDERCOVER TRADERS

POSING AS ORDINARY investors, we opened accounts with eight online brokers: market leaders Ameritrade, Charles Schwab, Datek, DLJdirect, E-Trade, and Waterhouse, as well as promising upstarts Discover Brokerage Direct and Suretrade. At each site, we tested how easy it is to open an account, place a stock trade, and get help. We pestered each firm's customer service department via e-mail and by telephone, both while the market was open and when it was closed. We also gauged the site's ease of navigation and the usefulness of its stock research tools.

We discovered that no broker has it all. Your choice will depend on what's important to you. If you need a little handholding, you'll want a firm that excels at customer service. If you want fast, no-nonsense stock trades, look for a broker that caters to frequent traders. And if you crave the cheapest trading, be prepared to wing it when it comes to getting answers to your questions. Check out "What Kind of Broker Is Right for You?" on page 180 for our recommendations based on four different investment strategies—one of which is probably yours.

GOING FOR BROKER

IF YOU THINK you can start trading as soon as you finish this article, think again. While some brokers, like DLJdirect and Suretrade, don't require a minimum deposit to open an account, most want at least $2000, and they don't take plastic. Allow at least five business days for your check to arrive and clear before your account gets started. The only exception: DLJdirect lets new customers trade as soon as their accounts are approved, usually within seconds of applying.

You'll probably need an hour or two to find and decipher the brokerage's minimum deposit requirements, fees, commissions, and account terms. Discover and DLJdirect were the best at providing this information; at E-Trade and Suretrade, we couldn't find it easily. But once our deposits had landed, trading was easy. In most cases, our initial order to buy shares of stock was filled in mere seconds—before we could even move from the confirmation screen to the order-status screen.

Of course, the more you trade, the more you pay in commissions. That's why low-cost Web brokers are attractive to investors who trade a lot. Instead of the typical $100 to $175 fee a traditional broker charges, you can pay anywhere from $8 per trade (Ameritrade and Suretrade) to $30 (Schwab). A limit order, which designates the maximum price you're willing to pay for a stock, might cost a few dollars extra. And with most online bro-

RATING THE BROKERS — FEATURES COMPARISON

TRADING SITE	Fees and features								
	Minimum equity to open account	Online trade commission [1]	Phone trade commission [2]	Maximum no. of shares at minimum commission	Extras for large accounts or frequent traders?	Access to IPOs	Online account application process	Account agreement on site	Trade done in less than a minute
Ameritrade 800/454-9272 www.ameritrade.com	$2000	$8	$12-$18	none	○	○	●	●	●
Charles Schwab 800/435-4000 www.schwab.com	$2500	$30	$39	1000	●	● [5]	○	○	●
Datek Online 888/463-2835 www.datek.com	$2000	$10	$25	5000	○	○	●	●	●
Discover Brokerage Direct 800/688-6896 www.discoverbrokerage.com	$2000	$15	$15-$34	5000	●	○	○	●	○
DLJdirect 800/825-5723 www.dljdirect.com	$0	$20	$20	1000	●	● [6]	●	●	●
E-Trade Securities 800/786-2571 www.etrade.com	$1000	$15	$15-$25	5000	●	● [8]	●	●	●
Suretrade 800/909-6827 www.suretrade.com	$0	$8	$12-$35	5000	○	● [9]	●	●	○
Waterhouse WebBroker 800/934-4410 www.waterhouse.com	$2000	$12	$35-$45	5000	○	○	○	○	●

● Yes ○ No [1] Lowest available rate. [2] Range of lowest rates for trades placed via touch-tone phone or conversation with live agent. [3] If online service is unavailable, lowest commission rate will be honored for phone trades.

kerages, placing trades by phone—via an automated system or by talking to a flesh-and-blood broker—will run you a bit more.

One great advantage of online trading is easy access to more reports and charts than you'll find in any discount broker's office. Though this information is available elsewhere on the Web for free, the best brokers merge it directly into your portfolio display—offering links to quotes, charts, and news of your holdings, so you can keep tabs on your investments. Charles Schwab, Discover Brokerage Direct, and DLJdirect are the best at integrating research into customers' portfolio views.

And keep in mind that though we only rated brokerages on their stock trading capabilities, you might also want to consider how a firm stands up when it comes to mutual funds, bonds, options, and other investments. If you're looking for a place to park your retirement funds, all of these firms offer IRA, Roth IRA, and other retirement accounts—just watch out for the annual fees that are frequently charged for these plans.

WORRIED ABOUT A MARKET MELTDOWN?

IF YOU HAVE concerns about the ability of online brokerages to stave off disaster in a market crisis, read "Can Your Web Broker Handle a Market Meltdown?" on PC World's site at www.pcworld.com/feb99/brokers.

HELP WANTED

WHEN IT COMES TO PROVIDING HELP, nearly all the firms could use a lesson in customer care. Few of the brokers responded to our e-mailed questions in what we considered a timely fashion. The best of the bunch was Charles Schwab, whose representatives even telephoned us in response to one of our e-mail inquiries. At the other end of the spectrum, Suretrade's software system sent back immediate responses to our questions, but they were nearly always wrong or incomplete.

We also spent an average of 5 minutes on hold waiting for customer service representatives, no matter what time of day or night we called. But once we were connected, most representatives were knowledgeable and helpful, if sometimes hurried—more than a couple rushed through our call.

IS YOUR MONEY SAFE?

IF THE THOUGHT of spending thousands of dollars trading stocks over the Web makes your stomach flutter, relax. All online brokers require that you use a secure browser to connect to their sites, so information flowing between the broker and your computer is encrypted, and thus protected from prying eyes on the Net. Since brokers send funds only to an account's address of record, the account can't be raided. "The worst thing any hacker could do is make malicious trades," according to Steve Hall, senior analyst with Gomez Advisors, a financial services research group.

If you're concerned about getting online on a busy market day, don't worry. Most Web brokers provide online service guarantees, in which the online rate is honored if the network goes down and you have to make a phone call. (Sometimes, of course, the market is downright volatile. *PC World*'s Web site—see the box above left—has more on the ability of online brokers to handle such crises.)

Keeping these assurances in mind, we jumped feet first into the trading pit. Despite the occasional annoyance, we found online trading to be relatively painless. And while no online brokerage excels in all areas, we'd happily give up trading by touch-tone phone or talking with a live broker for the ease and speed of placing orders with an online outfit. ▶

		Ease of use						Customer service [4]			
								Telephone		E-mail	
Online service guarantee [3]	Toll-free support hours	Site navigation	Trading interface	Access to stock information	Quality of research tools	Access to account	Account customization	Promptness	Helpfulness	Promptness	Helpfulness
○	M-F 6 a.m. - 10 p.m. EST	very good	good	good	good	good	very good	very good	good	poor	fair
●	24 hours daily	good	very good	very good	excellent	very good	excellent	good	excellent	excellent	excellent
●	M-F 8 a.m. - 7 p.m. EST	very good	excellent	very good	good	very good	good	excellent	very good	poor	good
●	M-F 9 a.m. - 7:30 p.m. EST	good	good	very good	good	very good	very good	excellent	fair	fair	fair
●	24 hours M - F [7]	very good	very good	excellent	very good	very good	poor	very good	excellent	poor	poor
●	M-F 8 a.m. - 9 p.m. EST	good	good	very good	very good	good	good	fair	good	fair	very good
●	M-F 7 a.m. - 6 p.m. EST	very good	good	good	very good	fair	poor	good	good	poor	poor
●	24 hours daily	fair	excellent	good	excellent	very good	poor	good	excellent	good	good

[4] Based on two phone calls and two e-mail messages.
[5] "Schwab 500" clients only.
[6] Minimum $100,000 account balance.
[7] 8 a.m.-10 p.m. weekends.
[8] For IPOs offered via BancBoston Robertson Stephens, must subscribe to Professional Edge ($25/month).
[9] Must qualify.

WHAT KIND OF BROKER IS RIGHT FOR YOU?

THE FIRST QUESTION you should ask yourself before taking the online stock trading plunge is, "What kind of investor am I?" Once you determine what your personal investment style is, you can choose a brokerage firm that best complements your trading habits. Here are four types of investor and the road we think each should travel.

THE NEWBIE

IF YOU'RE new to the Web or new to investing, a brokerage site's overall service is the most important factor. A firm with highly rated customer service can help ease your nerves as you get started: Charles Schwab and Waterhouse might be good bets in this area. And if the Web still throws you for a loop, look for a site that offers telephone trading at no additional charge. The tops in this category are E-Trade and DLJdirect.

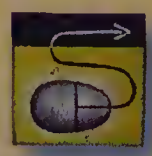
THE BUY-AND-HOLD TYPE

YOU BUY stocks for the long term? A $30 commission on a stock you own for ten years won't dent your overall returns much. Since you'll want to do extensive studies of stocks or mutual funds before buying them, a site's research tools should be the most important factor in your choice. Charles Schwab and Waterhouse are great places to get the lowdown on potential purchases.

THE ACTIVE TRADER

DO YOU buy and sell stocks at least once a week? If so, low commissions could save you big. Just remember that frequent trading can be costly in other ways. Investors typically lose a few cents on each trade due to the "spread" (the difference between the selling and purchase prices of a stock), which is pocketed by the brokerage. Look for a broker that offers "price improvement," in which the firm executes trades in alternative markets to get the best share prices. For the frequent trader, we like Datek for its near rock-bottom commissions and trader-friendly practices.

THE DELEGATOR



IF YOU don't think you've got what it takes to manage your own portfolio, a full-service bricks-and-mortar brokerage firm might be your best option. Though well-established firms like Salomon Smith Barney and Merrill Lynch don't broker trades online, they do offer online access to account information and background research. Still, most of your interactions will be face-to-face or on the phone with a personal account executive who can help with any financial questions you might have—from managing your portfolio to planning for your estate.

Ameritrade
A SQUARE DEAL

AMERITRADE IS a study in contrasts. Its opening pages are bold, colorful, and slow to download, but inside, the pages are sleek and stark. It offers one of the lowest minimum commissions around, but hidden fees quickly raise the ante. And though the site is festooned with testimonials from satisfied customers, its customer service policies are less than ideal.

The best part of Ameritrade is access to MarketGuide research, which includes a free stock screening tool and regular data updates. Unfortunately, there's no way to get information about a company from all of Ameritrade's research suppliers at once. And while the site features daily commentary from Andrew Tobias, one of the most knowledgeable financial writers around, you have to dig to find his daily gems.

Still, Ameritrade's $8 commission for online orders ties with Suretrade's for the cheapest of the bunch. When you use the touch-tone service, the commission is $12, and it jumps to $18 if you place your order with a broker directly. Limit orders cost $5 extra. Three of the firms in our survey charge extra for limit orders, and those little charges start to add up after a while. But because Ameritrade's fee schedule is buried, it's hard to know how much an account might cost you.

Ameritrade's customer service also seemed wanting: We're still waiting for a response to one of our e-mail queries. Phone service was better, but we were dismayed by some of what we heard. When we asked what would happen if Ameritrade's servers were down when we wanted to place a trade, the agent said we could use the brokerage's touch-tone system or talk with a broker directly. Fair enough, but Ameritrade doesn't honor the online rate in that case. All the other brokers we surveyed assured us they'd honor the lowest commission if their technical problems prevented us from trading. For cautious investors, the less-than-friendly "market meltdown" policy might tip the scales against this otherwise decent site.

Charles Schwab
MR. POPULARITY

TAKING THREE times as many online trades a day as the next most popular site, Charles Schwab is the undisputed king of online brokers. Why do so many investors like Schwab? One reason is that the brokerage firm offers white-glove treatment, including discounts on commissions and the chance to participate in IPOs, for active traders and customers with big accounts.

Schwab's online securities research is another. Just type in a ticker symbol, and up pop news, charts, analyst and industry reports, earnings estimates, and updates on insider trading activity. You can find this information elsewhere on the Web, but you won't find it arranged as intelligently as it is at Schwab.

Of course, these extras will cost you. At a minimum of $30 a trade, Schwab is the most expensive of the brokers in our survey. It also requires the highest minimum initial investment ($2500) and levies a maintenance charge on accounts that are smaller than $10,000. If you don't have at least $10,000 to open a stock trading account, you should probably avoid ▶

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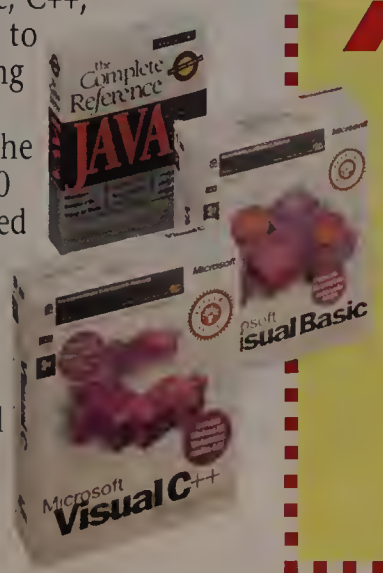

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the firm—commissions will eat up too much of each purchase.

If you do have $10,000 to invest, you'll like Schwab's sensibly arranged order-entry screens, rapid confirmation messages, and customer service. We received timely responses to our e-mail inquiries—an agent even called us to respond to an e-mailed question three times, at work and at home. We did pretty well using the phone, too. It took an average of 11 minutes during off-peak hours and 2 minutes during the market day to reach agents, but they wasted no time answering our questions. And if you really need help, you can drop by one of Schwab's 270 branch offices and talk with someone face-to-face.

Datek
FAST COMPANY

IF YOU WANT your hand held online, steer clear of high-powered Datek. You won't find much in the way of research tools here, and it can be costly to place a trade with a real person. But Datek's claim to fame isn't customer-friendly accoutrements, it's speed. Hard-core traders will appreciate the Express Server interface, which skips the standard "Are you really really sure you want to make this trade?" confirmation screen. For the less confident investor, Datek also offers the standard trading interface, as well as a "classic" interface free of fancy graphics.

If you place an order with Datek and it's not executed within 60 seconds, the commission fee is waived (assuming, of course, that the order is marketable). And Datek will honor the $10 online commission rate if the network goes down during trading hours and you're forced to place an order by phone. If your own ISP ever fails, Datek provides a dial-up number so you can connect directly to its servers.

Customer support was pretty peppy, too. We got answers to some—not all—of our e-mailed questions within two business days, and the customer service people picked up the phone promptly, rattling off answers as fast we could ask the questions. With this emphasis on getting down to business, the site won't win any design awards. But it is easy to navigate. And if you feel the need for speed, Datek can't be beat.

Last December Datek announced plans to operate its Island trading network as a stock exchange. If that happens, customers might be able to get even better prices on stock trades, an important consideration for frequent traders. ▶

Wall Street Meets Easy Street Placing your trade on Datek's bare-bones order entry screen is a breeze.

TRADE SECRETS: TIPS FOR WEB INVESTORS

KEEP THESE TIPS in mind as you plan your online investment strategy:

Lower your costs. A good rule of thumb is to keep the cost of trading below 3 percent of your total investment amount.

Watch for Y2K bugs. Because the online brokerage industry is so new, it doesn't make much use of older systems, which can be riddled with millennium (year 2000) bugs. But these sites do interact with other computer networks that could have problems. Protect your investments by making sure your broker is Y2K compliant. Some firms, like Charles Schwab, publish a statement of their Y2K readiness on their sites. If they don't, then find out what their policy is.

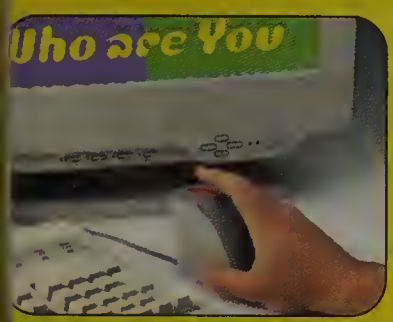
Be redundant. Open brokerage accounts with two or more companies and have a backup ISP available in case you can't dial up your usual provider. (Many ISPs offer limited-access accounts for $5 to $10 a month.) That way, you will always have solid backups in the event your online broker or ISP fails you.

Plan for Armageddon. For days when the market goes haywire, choose a broker with a "market meltdown policy" that offers telephone trading at the same price as online trading, or will waive the difference if you can't log on to the site.

Stay on top. For updates on Web-based investing houses, visit Gomez Advisors, a research company that reviews and ranks online brokers. You can find the Gomez scorecard at www.gomez.com. And while you're surfing the Web, check out the site managed by Don Johnson, an independent investor. You can find his "Discount Stock Brokers Ranked" report at www. sonic.net/donaldj.

Give your computer the finger!

"Because It's Really You"



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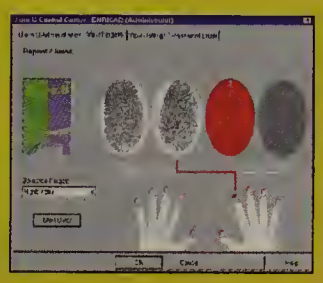

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Discover
ROCKY START

DISCOVER BROKERAGE DIRECT is a site with big ambitions. An ad campaign last fall suggested that by trading with Discover, you could earn enough to buy an island. But we hit some choppy water.

For one thing, it took more than a week of e-mails, calls, and faxes to activate our account. Once it was open, we found some things to like. For instance, it's easy to customize your home page with specifics about your favorite stocks, market indexes, and account information: Just point and click the items you want to see when you log on. And news, charts, reports, and quotes are available from your portfolio view. You can also purchase stock reports.

The order-entry screen was logically arranged, and our order was filled within two minutes. But at the confirmation screen, we had to scroll down to get details on our trades, listed in hard-to-read rows.

Discover's online and touch-tone commissions start at $15 for a market order and $20 for a limit order. But if you place a trade by phone, the commission jumps to 1.5 to 2 cents per share (depending on whether the stock you trade is listed on NASDAQ or an exchange), with a minimum of $34.

Since Discover Brokerage Direct is owned by investment bank Morgan Stanley Dean Witter, we won't write off the site's chances for success. But it's hard to find many compelling reasons to fall in with Discover at this stage of the campaign.

Buried Deep To find confirmation of your trades at Discover Brokerage Direct, you have to dig to the bottom of the screen.

DLJdirect
LIKELY TO SUCCEED

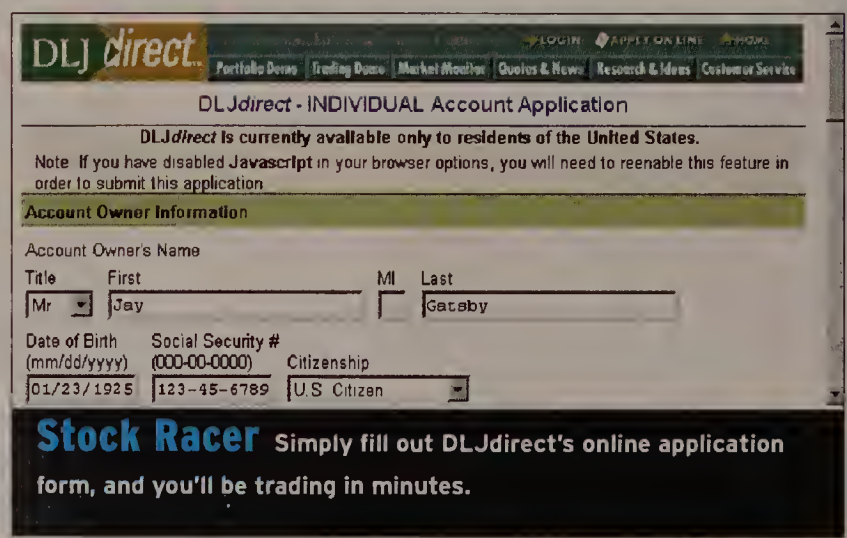
OF THE FIRMS we looked at, DLJdirect would have been "Most Likely to Succeed" in high school. Lean, good-looking, and a little aloof, the site took home mostly Bs on its report card, an occasional A, and only a few low grades.

The site's design made it easy to log on, move around, and place an order. But attractiveness comes at a cost: The site's reliance on graphic buttons and menus can slow things down—not a strong point for the active trader.

The application form, however, is good for those who want instant gratification. Upon completion, your account can be approved for trading, with no minimum opening balance. If your credit is good, you can buy and sell stocks in seconds. Within a few days, you'll receive a form to sign and return with a check.

Our trade order was filled almost at once. The minimum commission is $20, whether you trade by modem or phone. DLJ's telephone representatives, all licensed by the National Association of Securities Dealers, were helpful, and wait times were average—around 5 minutes—no matter when we called. But we never got a response to questions we sent by e-mail.

DLJdirect's selection of research tools, midrange commission rates, and 24-hour weekday phone access might be just the right mix for slower-paced investors. And if you have $100,000 or more in an account, you could get in on the ground floor of an IPO offered by DLJdirect's parent company, the investment bank Donaldson, Lufkin & Jenrette.



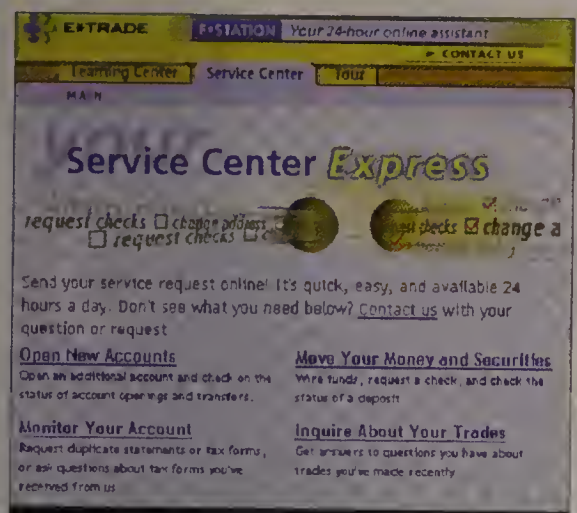
Stock Racer Simply fill out DLJdirect's online application form, and you'll be trading in minutes.

E-Trade
IT AIN'T EASY

E-TRADE WANTS to be all things to all people. In addition to trading, the site offers a range of investment ideas, message boards, and other freebies to anyone looking to improve their financial well-being. But all these extras also make trading on the site a much more complicated affair than it needs to be.

E-Trade tossed a surprising number of obstacles in our path. Casual visitors must register as "members" to access some of the financial research tools. But if you decide to become a "customer," then you might have to memorize a cryptic new user name and password (as we did). And anytime we moved from a customer area to a member area, we had to log in. Worse: We also had to enter a password every time we wanted to buy or sell a holding. (Suretrade is the only other broker in the bunch that requires a separate trading password.) Still, minimum commissions are a flat $15 for online or phone transactions, and the trading screens are intuitively organized.

Once we had all our passwords and user names straight, we were able to access E-Trade's research tools. By entering a stock's ticker symbol into a search field, we tapped into nearly 20 pages of detailed reports and charts, mostly provided by Disclosure's Baseline service. But to get real-time stock quotes, we had to fill out another registration



Doing It All E-Trade's online service center is meant to replace phone support.

form. E-Trade does provide unlimited stock quotes once you do register—a bonus most other firms don't offer.

We spent more time on hold when calling its customer support line during the market day than at any other firm—over 10 minutes. Even so, the reps were knowledgeable and helpful, and e-mail support was better than most brokers'.

With practice, a user could get used to E-Trade's registration levels and multiple passwords. But in the competitive Net broker business, we wonder how many will want to.

Suretrade
NOT A SURE BET

SURETRADE EMPHASIZES no-frills services at a minimum commission of $8. And no frills is what it delivers.

Opening an account at Suretrade is tedious work. You can do it on the site, but you have to fill out a long form, and then print, sign, and return an online service agreement along with your check. Suretrade then requires five business days for your personal check to clear. So while you can open your account right away, expect to wait another week or two before you can make your first purchase.

We also found it hard to navigate the site. Each area uses its own navigational buttons, links, and menus. And the research tools—a mix of resources from Thomson, Zack's, Reuters, BigCharts, Briefing.com, and Baseline—are delivered in frames, each with its own menu of options and system of navigation. While there's a lot to choose from, it's a mix of the same free information you can find elsewhere on the Web, with some premium services tossed in. A centralized ticker lookup page would allow better access to these materials.

Once we started trading, a couple of minutes passed before our stock purchase was confirmed—one of the slowest responses in our survey. We also found the site to be a bit sluggish even during a normal trading day, which made us wonder about its performance on days when the market is hectic.

Suretrade's bare-bones approach means it doesn't stand on ceremony when it comes to customer service. The brokerage's e-mail support is based on a software program called "the Brain," which sends automated responses to questions. The answers we got from this "smart" software were laughably bad and consistently unreliable.

On a positive note, Suretrade charges no fees for extra services, including the issuance of stock certificates. But that's unlikely to convince most investors that Suretrade is a sure thing.

Waterhouse
RESEARCH ENGINE

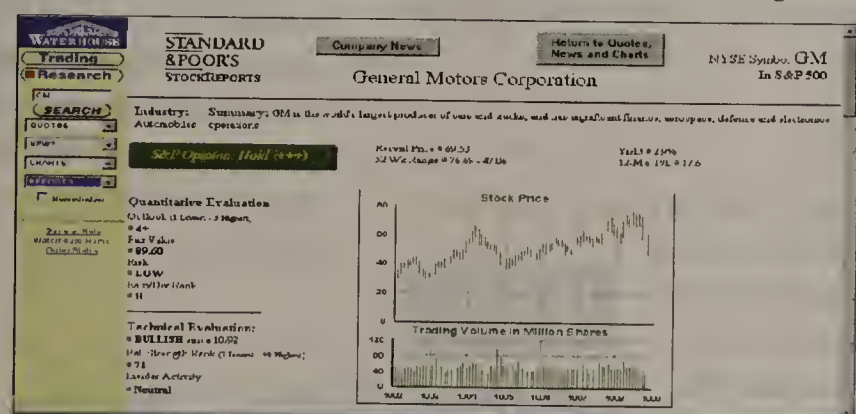
FOR CUSTOMER service, it's hard to beat Waterhouse WebBroker. When you sign up, you get an account officer who provides personal attention when needed. This privilege costs, though. Waterhouse's $12 minimum commission jumps to $45 when you place an order with an account officer.

In other ways Waterhouse has a way to go to catch up with its online brethren, particularly when it comes to opening an account. You can't apply for an account online, and once your account is open, you still have to call to get a password before you can trade on the Web.

We also had problems with the site itself. We often got stuck trying to use the JavaScript drop-down menus, in which you select an item from a drop-down box and the appropriate page loads automatically before you can click on "Go."

When you enter the site's Research section, be sure to type in a ticker symbol in the box at the top of the screen before selecting a report from S&P, Briefing.com, or MarketGuide. If you don't, you'll get an obscure error message. Navigation style also varied by page, from a text menu of choices on the side of the browser window to graphic buttons at the bottom of the page.

Despite the frustrating interface, it was easy to place an order. The site's stock trading screen stepped us through the process, and the confirmation screen linked us right to the order-status area. Our order to buy was filled within 60 seconds.



Star Reports At Waterhouse, Standard & Poor's invaluable stock reports are yours free.

Waterhouse's Standard & Poor's Stock Reports were the best research tools we saw. Other sites charge a dollar or two for each report, so having the library for free can save money. One thing we couldn't find was a copy of the account agreement, and it wasn't for lack of trying. Guess we could have used that pricey personal account officer after all.

online

See www.pcworld.com/feb99/brokers for more about online trading. Douglas Gerlach is the author of The Complete Idiot's Guide to Online Investing *(Que, 1998), and the creator of investorama.com, a financial Web site.* ■

"Tired of

Get the speed YOU need.

If you've been holding out for the cable or telephone company to bring high-speed Internet access to your neighborhood, chances are it's been a while. Which is a shame, because if you'd chosen DirecPC, you could be surfing at up to 400 Kbps **right now**. That's up to 14 times faster than a standard 28.8 modem and almost three times faster than an ISDN line.

It's easy.

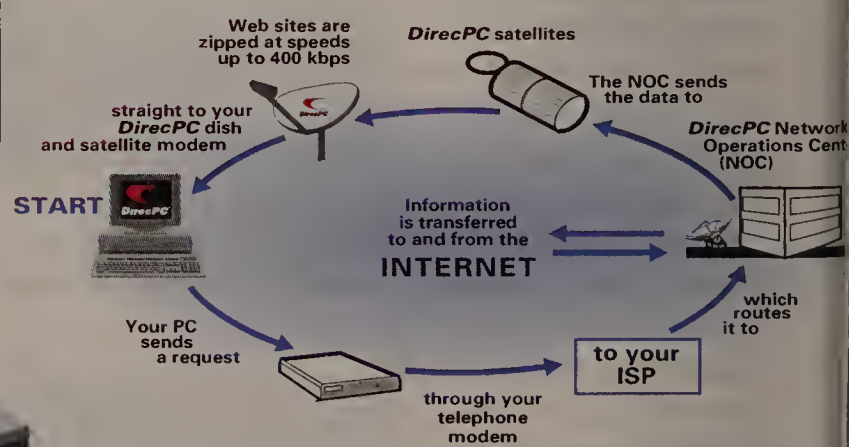
How do you get started? Just visit us at www.direcpc.com to find a retailer near you. If you can't find a store in the neighborhood, call us at 1-800-DIRECPC. We'll send you your dish, satellite modem, software and everything else you need. We can arrange professional installation for you, too. Either way, getting started is just a phone call or a mouse click away.

HARDWARE AS LOW AS

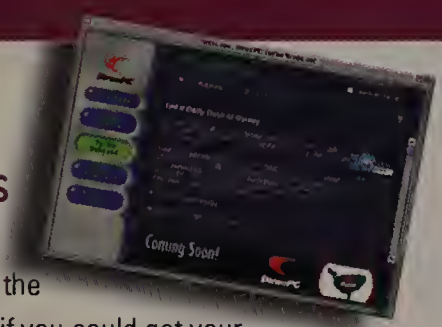
$199

How does it work?

The engineers at Hughes figured out that the real bottleneck in the speed of the Internet wasn't the request **out** to the Web — telephone modems handle that just fine. Everything slows down when the Web tries to use the telephone system to send you **back** the media-rich information you requested. So, we use a much faster satellite connection for sending you the Web content you want. Check out the diagram — this is the system that makes DirecPC the fastest Internet access available nationwide.



waiting?"



DirecPC gets pushy.

Sure, you love the idea of surfing the Web at up to 400 Kbps. But what if you could get your favorite Web sites and Usenet Newsgroups delivered straight into your PC by satellite — **automatically**, without even having to tie up your phone line to ask for them? That's just what DirecPC's Turbo WebCast™ and Turbo NewsCast™ services do — so you're never behind on the news and information that's important to you. The best thing about these two services? They're **free** with your paid subscription to any Turbo Internet™ service package.

SERVICE AS LOW AS

$19.99 MO.

The good news.

No other high-speed Internet access provider offers so much for so little. Take a close look at our service pricing — we're sure you'll find a package you like.

Want TV with that?

We know what you're thinking: "If I'm going to put a dish on my roof, I might as well sign up for one of those satellite TV services, too." We agree! That's why, for a few dollars more, you can upgrade to our DirecDuo™ dish with your DirecPC satellite modem. Add a Hughes-brand digital satellite receiver (or the receiver you already own), and you get almost 200 channels of crystal-clear satellite TV from DIRECTV® as well as Turbo Internet from DirecPC. Just call 1-800-DIRECPC or stop by www.direcpc.com to find out more.

You already know how great the Internet is — you're just looking for a way to go faster. DirecPC is the fastest Internet access available nationwide. It's affordable, and it's available everywhere. So, if you're still plugging away with an old-fashioned telephone modem, you need to ask yourself:

What are you waiting for?

Service Plan Details	Residential		Business
Name of Service Plan	Executive Surfer	Family Surfer	Office Surfer
Price of Service Plan (Including ISP)	$29.99/Month	$49.99/Month	$129.99/Month
Price of Service Plan (Without ISP)	$19.99/Month	$34.99/Month	$109.99/Month
Hours of Service (Availability)	24 Hours a Day	24 Hours a Day	24 Hours a Day
On-Line Time (Hours of usage for Turbo Internet)	25 Hours/Month	100 Hours/Month	200 Hours/Month
Additional Hourly Rate (Including ISP) Additional Hourly Rate (Without ISP)	$1.99/Hour $.99/Hour	$1.99/Hour $.99/Hour	$1.99/Hour $.99/Hour
DirecPC Services			
Turbo Webcast: Broadcast delivery of popular Websites to your PC's hard drive	Included	Included	Included
Turbo Newscast: Broadcast delivery of up to 30,000 Usenet Newsgroups to your PC's hard drive	Included	Included	Included
Turbo Internet: Fully interactive access to the Internet at speeds up to 400Kbps	Included in Online Time	Included in Online Time	Included in Online Time
Free E-mail Accounts	1	1	4
Networking (Number of Seats)	N/A	N/A	4

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DirecPC™

$199 hardware price after DirecPC rebate. New Credit card customers only. Expires 3/31/99. $100 rebate posted to credit card upon service activation. 12-month commitment to service required. $100 cancellation fee charged to credit card if service canceled within 12 months. Cannot be combined with other DirecPC promotions. Executive Surfer and Family Surfer packages for single-user systems only and subject to Fair Access Policy and Subscriber Agreement. Speeds may vary. Not available in Alaska or Hawaii; requires line of sight to the southern sky.

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A monthly update of the best desktop PCs, notebooks, printers, monitors, graphics boards, and modems

PC WORLD

TOP 100

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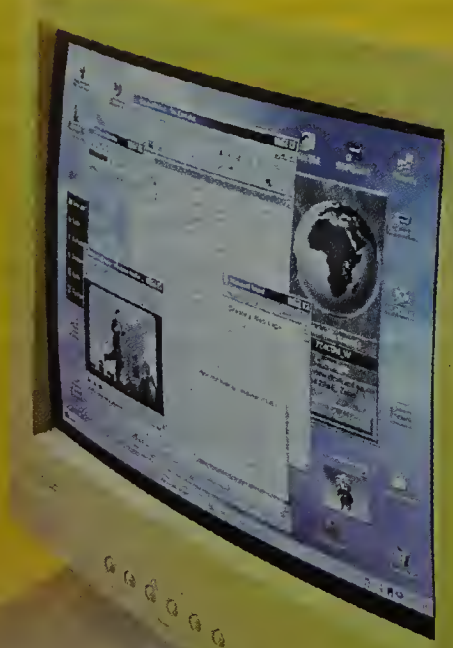
Are Store-Bought PCs Endangered Species?



JUST SHIP IT: Compaq's Prosignia Desktop 330 is built to order and sold direct.

Edited by Michelle Campanale and Cameron Heffernan

CHANCES ARE you'll buy your next PC over the phone, via the Web, through mail order, or even from a value-added reseller who gets a bounty direct from the manufacturer for each unit it sells. Though the players and the hardware remain much the same in this month's Top 20 charts, the way consumers buy computers has changed. Stores without doors are fast becoming the rule, and off-the-shelf systems may soon go the way of the dinosaurs.

SHORT-NECK monitors vary in depth; the model at right saves only about a half-inch over a standard monitor.

DEATH OF A SALESMAN

MORE AND MORE PC vendors are marketing their wares to small and medium-size businesses, which value a low price tag. Selling direct allows companies to offer basic machines at the lowest possible prices, so it's no surprise that all our Top 20 Best Buys this month can be purchased direct.

Dell, Gateway, and Micron have been bypassing the reseller for years. But now they have company: For example, Compaq's new Prosignia Desktop 330 and IBM's PC300GL Small Business Edition (which we'll review in March) target small businesses and can be custom-configured and bought over the Web or telephone.

MODEM TO GO: Diamond Multimedia's SupraExpress 56e.

To compete with computer vendors that sell direct, retail stores have had to change the way they do business. One large chain, CompUSA, sells built-to-order systems not only to in-store customers, but also to customers ordering via the phone or the Web, who also can select the exact components they want included in their PC.

Still, selling direct isn't exactly a new concept to companies such as Compaq, which have historically relied on channel and retail sales. In fact, Compaq has been quietly selling specific models from different product lines—such as the Armada and Presario series—on its Web site's Direct Plus and At Home sections for five or six years. The Prosignia line, however, represents Compaq's first product line that emphasizes direct sales across the board.

BLUE LIGHT SPECIALS

MOST SYSTEMS on our charts can be purchased direct. That's good news for consumers. In fact, the average power system this month costs just $2381.

As they make way for PCs with new processors, vendors are pricing their current stock to move. (For more information, see "Your PC in the New Millennium," page 104.)

New technologies, expected to appear in PCs by April or May, could have a big impact on the charts, pushing Pentium II-400 and even Pentium II-450 machines onto the sub-$2000 budget chart. That's great for folks who want good performance but don't need next season's top-of-the-line processor. Falling PC prices should begin to even more closely mirror price drops in Intel processors (see "AMD-Powered PCs Get Big Cuts," next page).

BYE-BYE ISA?

DESPITE THE RAPID emergence of new technologies, old technology tends to stick around in PCs longer than you might expect. Many of us own Zip or LS-120 drives, yet we still use floppies regularly. Universal Serial Bus ports come standard in new PCs, but many users continue to connect peripherals via parallel or serial ports.

Last November, Microsoft and Intel introduced their "PC99" spec, which focuses on phasing out ISA slots. But here it is February 1999, and we still see ISA slots in all the PCs on our charts.

But don't expect ISA to vanish overnight. Sim Wong Hoo, chairman and CEO of Creative Labs, says that Creative has no plans to phase out the ISA-based Sound Blaster 16 card, targeted at corporate IT departments: "It's still a very big market because they buy in volume." He also says his company will continue to market the 6-year-old, $49 product well into this year. In fact, he reports, "We're trying to stretch it into the year 2000."

Certainly PC users haven't abandoned their ISA-based peripherals. For one thing, PCI-based peripherals aren't always better. For example, though PCI modems use much newer technology than their ISA counterparts, they actually exhibited

more reliable connections in our modem testing. That's because ISA modems normally come with their own built-in controller. (See January's *Top 10 Modems*, www.pcworld.com/jan99/modems, for more details.) In this month's *Top 10 Modems* chart on page 225, we list the top seven internal and top three external V.90 modems—the former based on either ISA or PCI technology. Next month, look for PC Card modems and more internal desktop modems as part of our modem rotation.

MONITOR PRICES: A NEW VISION

PRICES ON BOTH 19- and 21-inch monitors continue to drop. On the 19-inch half of the chart (page 221), only two monitors, Sony's $699 Multiscan CDP-420GS and ViewSonic's $699 MB90, are priced above $600, while 21-inch models range from $999 to $1299. The best news: These price cuts don't come at the expense of image quality. The 19-inch Dell UltraScan P990, for instance, delivers bright, rich colors for only $549.

Intriguing recent features on monitors include short necks and USB ports and hubs. Short-neck monitors can save a bit of space in cramped offices. About a year ago, the first such monitors we saw suffered from fuzziness in the corners of the screen. But Sony's 21-inch Multiscan CDP-520GS short-neck matches the display quality of its full-size peers.

USB monitors are beginning to make inroads into the Top 10 chart. The 19-inch ViewSonic MB90 with integrated speakers has a single upstream port—to handle the decidedly atypical demands of people who want to run two PCs on a single monitor—and four downstream ports for various USB peripherals.

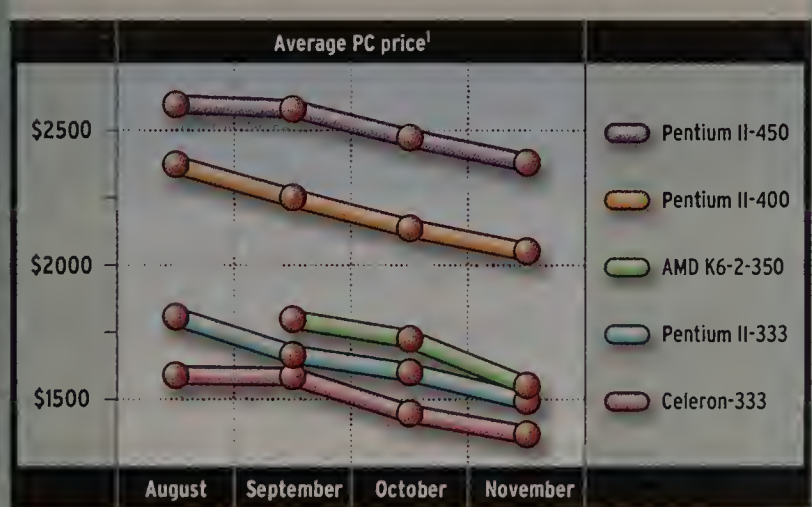
POTENT PORTABLES

AFTER PROTRACTED delays, Accelerated Graphics Port technology has finally arrived in notebooks—including the WinBook XL2, which takes third place on this month's power notebooks chart (page 212). To see if the newly portable technology is worth its weight in pixels, we tested two AGP-equipped laptos against two using the standard PCI bus. While the AGP notebooks ran smoother and faster, their PCI counterparts produced jerky, blocky results. The improvements will cost you: Loaded with faster CPUs, more RAM, and higher-end video processors, AGP notebooks cost about $500 more than their PCI counterparts.

Michelle Campanale and Cameron Heffernan are associate editors for PC World. *Senior Associate Editors Vince Bielski, Bryan Hastings, and Karen Silver; Associate Editor Andrew Brandt; Staff Editor Grace Aquino; Assistant Editor Mick Lockey; Editorial Assistant Kalai Murugesan; and freelance writers Gordon Meyer and JoAnne Robb contributed to the* Top 100. *Ulrike Diehlmann, Robert James, Elliott Kirschling, Jeff Kuta, Nancy Miller, and Mike Salayko of the PC World Test Center performed testing for the* Top 100. *See page 14 for contact information.*

AMD-Powered PCs Get Big Cuts

AVERAGE PC PRICES sank by about $100 between October and November of last year. Systems based on AMD's K6-2-350 processor fell the furthest—$174 on average.



[1]Prices are as collected for our Top 20 charts. Months represent the dates in 1998 when we collected prices, not the magazine issue dates. The number of averaged PC prices ranges from 5 for the AMD K6-2-350 to 35 for the Pentium II-400.

YOUR GUIDE TO THE TOP 100

QUESTIONS ABOUT OUR CHARTS? The following section should answer most of them.

How do the charts work? The Top 20 and Top 10 charts are evolving lists of the best PCs, printers, monitors, graphics boards, and modems we've tested. System charts are divided by price. Power desktops cost $2000 or more; power notebooks cost $2750 or more. We compare new products with previously reviewed hardware, updating the charts to reflect price cuts as well as other changes.

Where do you get your prices? We estimate street prices based on vendor information and our own research, including surveys of retail outlets. We recheck all prices every month.

What does the overall rating mean? This 100-point scale reflects results from our hands-on evaluations and performance tests. A score in the 90s is exceptional, while one in the 80s is among the best and one in the 70s above average.

What does the PC WorldBench 98 score mean? It's a measure of how fast a PC is in relation to our baseline machine, a Gateway PMMX-200 configured with 32MB of RAM, a 2GB hard drive, and 512KB of secondary cache. A PC that scores 200, for instance, is twice as fast as the baseline system.

Where do the scores for reliability, support quality, and support policies come from? Reliability and support quality scores are based on surveys of *PC World* readers and anonymous support calls made by *PC World* staff. The policies score is based on vendor support policies.

What do all those word scores mean? Word scores for performance and price are based on a product's rating in relation to other products in its category. For instance, we score the performance of Windows NT PCs separately from that of Windows 95 machines. (Based on our PC WorldBench 98 tests, Windows NT machines are faster on average than Win 95 PCs.)

Check out *PC World*'s Top 400 reviews online. Point your browser to PC World Online (www.pcworld.com/top400) to explore our Top 400, which provides comprehensive reviews and ratings for products in 16 different categories. You'll also find reviews not available in print.

PC WORLD

TOP 20 POWER DESKTOPS

	SYSTEM	Last month	Month tested	Street price (11/20/98)	CPU	Comments
1	Dell OptiPlex GX1 400 800/289-3355 www.dell.com	2	Aug 98	$2145	Pentium II-400	Zippy corporate PC with easy-service design gets $275 price cut; speakers extra.
2	Micron Millennia 400 Max 888/634-8799 www.micronpc.com	1	July 98	$2028	Pentium II-400	Micron slashes $193 off fastest Win 95 PII-400; DVD-ROM and Zip drive included.
3	Gateway GP6-450 800/846-2000 www.gateway.com	3	Jan 99	$2314	Pentium II-450	General-business PC with management options, network card, modem sheds $179.
4	Dell Dimension XPS R450 800/388-8542 www.dell.com	4	Nov 98	$2529	Pentium II-450	Well-built PC for small to midsize businesses has DVD-ROM drive but no Zip drive.
5	Gateway E-4200 450 800/779-2000 www.gateway.com	n/a	NEW	$2399	Pentium II-450	Managed PC with strong warranty, support, and network card; slowest on chart.
6	MidWest Micro Business Solutions 400 800/728-8582 www.mwmicro.com	5	Dec 98	$2014	Pentium II-400	Inexpensive, network-ready PC runs NT and includes LS-120 drive.
7	Polywell Poly 8450 B5 800/999-1278 www.polywell.com	6	Jan 99	$2195	Pentium II-450	Name change on fastest Win 98 system; powerful multimedia and value price.
8	NEC Direction SP B450 888/863-2669 www.necnow.com	7	Dec 98	$2699	Pentium II-450	Expensive PC offers good speed, 19-inch monitor, and great reliability rating.
9	NEC PowerMate 8100 888/863-2669 www.necnow.com	11	Jan 99	$2768	Pentium II-450	Pricey corporate PC has network card and US8 monitor, but no software bundle.
10	Sys Technology Performance Pro 450 800/613-9963 www.sys.com	13	Dec 98	$2499	Pentium II-450	Price falls $200 on fast, networked PC with LS-120; improved service and support.
11	HP Brio 8500 PII-450 800/752-0900 www.hp.com	n/a	Dec 98	$2344	Pentium II-450	Fast Win NT PC gets Includes network card and CD-RW drive but has fuzzy monitor.
12	Acma ZPower 6450 PII-450 800/786-6888 www.acma.com	14	Nov 98	$2198	Pentium II-450	Acma takes $197 off PC with 128M8 of RAM and Zip drive.
13	Premio Apollo BX 450 800/677-6477 www.premiopc.com	10	Jan 99	$2224	Pentium II-450	Sturdy PC has lots of RAM and DVD-ROM drive but support policies are thin.
14	HP Vectra VL Series 8 HE 800/322-4772 www.hp.com	n/a	Nov 98	$2370	Pentium II-450	HP's high-end, multimedia-savvy corporate PC gets a whopping $490 price cut.
15	Quantex QP6/450 SM-4x SE 800/896-4898 www.quantex.com	n/a	NEW	$2499	Pentium II-450	Small-business PC includes 4.8X DVD-ROM drive and good software bundle.
16	IBM PC 300 PL 800/426-2968 www.ibm.com	12	Jan 99	$2519	Pentium II-450	Network-ready speed demon has network card and good price.
17	Compaq Prosignia Desktop 330 800/345-1518 www.compaq.com	n/a	NEW	$2429	Pentium II-450	New small-business PC has network card and modem; mediocre internal design.
18	Compaq Deskpro EP 6450 800/345-1518 www.compaq.com	9	Nov 98	$2343	Pentium II-450	Corporate PC includes convertible case and Zip drive.
19	NexTrend NexStar-450 PWJ 888/838-7827 www.nextrendpc.com	16	Jan 99	$2599	Pentium II-450	Swift system packs Zip drive and hardware MPEG decoder.
20	MidWest Micro Office Pro 450 800/728-8582 www.mwmicro.com	17	Jan 99	$2499	Pentium II-450	Midrange performer has Zip drive, 40X CD-ROM, and multimedia software bundle.

Best Buy See features chart, page 194; test report, page 196.

n/a = not applicable

[1]A system's performance word score is relative to scores of other PCs running the same operating system. For more details see "Your Guide to the Top 100" on page 191.

[2]For more information about all products in this table, select PC World InfoNet no. 903 or visit www.pcworld.com/infonet.

STEEP DISCOUNTS ABOUND on this month's power chart, as five systems drop $170 or more. Surprisingly enough, Hewlett-Packard makes the biggest cut, slashing $490 off the price of its corporate Vectra VL Series 8 HE; this Pentium II-450 system replaces the PII-400 edition that made the chart last month. In fact, only three PII-400s remain on the power chart, but they're all especially good values. Two are Best Buys, and one of these, Dell's Optiplex GX 1400, rises to become the first corporate-centric system to occupy the number one spot. Another managed PC, Gateway's new E-4200 450, also cracks the top five. It's somewhat slow compared to similarly equipped PCs, but it's cheap for its processor class.

SCORECARD

★ Overall rating	PC WorldBench 98/operating system	Performance	Features and design	Vendor's system reliability	Price	Vendor's support quality/policies	PC World InfoNet number [2]
89	244/Win NT 4.0	good	good	good	inexpensive	good/outstanding	620
88	210/Win 95	good	very good	good	inexpensive	good/good	621
87	213/Win 98	good	very good	good	average	fair/outstanding	622
83	212/Win 98	good	very good	good	average	good/good	623
83	204/Win 98	good	very good	good	average	fair/outstanding	624
82	233/Win NT 4.0	good	outstanding	[3]	inexpensive	good [4]/good	625
82	224/Win 98	outstanding	very good	[3]	inexpensive	good [4]/fair	626
82	220/Win 98	very good	very good	outstanding	expensive	good [4]/good	627
82	218/Win 95	very good	very good	outstanding	expensive	good [4]/good	628
81	222/Win 98	very good	outstanding	[3]	average	good [4]/good	629
81	263/Win NT 4.0	outstanding	satisfactory	good	average	good/good	630
80	217/Win 98	very good	good	[3]	inexpensive	good [4]/good	631
79	214/Win 98	very good	very good	[3]	inexpensive	good [4]/good	632
78	216/Win 98	very good	very good	good	average	good/poor	633
78	213/Win 98	good	outstanding	[3]	average	fair [4]/good	634
78	219/Win 98	very good	good	fair	average	good/good	–
78	210/Win 98	good	very good	good	average	fair/good	635
77	214/Win 98	very good	good	good	average	fair/outstanding	636
77	218/Win 98	very good	very good	[3]	expensive	fair [4]/good	637
76	210/Win 98	good	outstanding	[3]	average	good [4]/good	638
Scorecard weightings ▶		Performance 25 percent	Features 25 percent	Reliability 15 percent	Price 15 percent	Quality/policies 10 percent each	

[2] Insufficient data to give a rating.

[4] Scores were derived from anonymous support-quality calls due to insufficient data from survey.

This Month's Best Buys

1 DELL OPTIPLEX GX1 400

PRO: Attractively designed corporate system, easy access to interior, excellent monitor

CON: Relatively small hard drive, no AGP slot

Up one notch from last month, the Dell OptiPlex GX1 400 is the new number one Best Buy on our power chart. This $2145 corporate-oriented midtower features integrated remote management hardware and an easy-to-access interior, and logs an impressive PC WorldBench 98 score of 244. Dell's high reliability and service scores should clinch a spot for the OptiPlex GX1 400 on any corporate IS manager's shopping list.

The OptiPlex's modular case design allows every part of the system to swivel, glide, or swing open for easy access. Removing the cover is a snap: Just press a button on the front and flick the case-lock switch at the back, and the cover swings up and out of the way. Expansion cards mounted on a separate chassis slide out as you press a lever—no scraped knuckles here. The power supply pivots upward and provides easy access to RAM slots and the motherboard. Unfortunately, however, there's no AGP slot, so you won't be able to upgrade the integrated AGP graphics with a higher-end AGP graphics board in the future.

Dell OptiPlex GX1 400

But in general, upgrades shouldn't enter into the picture for some time, thanks to the hardware Dell already includes. The 6.4GB hard disk suffices for most uses, but all the other Best Buys this month come with 10GB. Dell's bundled UltraScan 1000HS monitor, one of the best 17-inch Trinitron displays currently available, delivers excellent image quality.

Dell ships the OptiPlex with the Windows NT 4.0 operating system and covers the machine with a three-year warranty on parts and labor. Telephone support lines operate around the clock.

2 MICRON MILLENNIA 400 MAX

PRO: Fast Windows 95 PII-400, 4X DVD-ROM drive, Zip drive, affordable, good reliability

CON: Mediocre audio and monitor, sparse documentation, lackluster labor warranty

The Micron Millennia 400 Max set the performance standard among Pentium II-400 systems when we first reviewed it in July 1998. Seven months later, its PC WorldBench 98 score of 210 still stands as the highest we've seen for a Windows 95–based PII-400. At $2028, it's easy on the wallet, too. The Millennia 400 Max comes loaded with attractive features, and our readers tell us that Micron's systems are reliable.

Micron Millennia 400 Max

This PC even looks fast, with chiseled curves and molded slots for its exter- ▶

TOP 20 POWER DESKTOPS — STANDARD FEATURES

	SYSTEM	CPU	Operating system	RAM (MB)	Secondary cache (KB)	Hard drive (GB)	Graphics adapter (AGP)	Video RAM (MB/type)	Monitor tube/ viewable diagonal (inches)	56-kbps modem protocol
1	Dell OptiPlex GX1 400*	Pentium II-400	Windows NT 4.0	64	512	6.4	integrated ATI 3D Rage Pro	8/SGRAM	17/15.9	not included
2	Micron Millennia 400 Max*	Pentium II-400	Windows 95	64	512	10	Diamond Fire GL 1000 Pro	8/SGRAM	17/16	x2
3	Gateway GP6-450*	Pentium II-450	Windows 98	64	512	10	ATI Xpert98	8/SDRAM	19/18	x2
4	Dell Dimension XPS R450*	Pentium II-450	Windows 98	128	512	10	STB Velocity 12Bzx	8/SGRAM [3]	17/16	x2
5	Gateway E-4200 450*	Pentium II-450	Windows 98	128	512	10	ATI Rage Pro Turbo	8/SGRAM	19/18	not included
6	MidWest Micro Business Solutions 400	Pentium II-400	Windows NT 4.0	128	512	12.7	STB Velocity 4400	16/SDRAM	17/15.8	not included
7	Polywell Poly 8450 B5	Pentium II-450	Windows 98	128	512	10	Matrox Millennium G200	8/SGRAM	17/16	V.90
8	NEC Direction SP B450	Pentium II-450	Windows 98	64	512	14.4	ATI Xpert9B	8/SDRAM	19/17.9	x2
9	NEC PowerMate 8100	Pentium II-450	Windows 95	64	512	14.4	Accel Graphics AccelStar 3D II	8/SDRAM	17/15	not included
10	Sys Technology Performance Pro 450	Pentium II-450	Windows 98	128	512	10.1	Matrox Mystique G200	8/SGRAM	17/15.8	V.90
11	HP Brio 8500 PII-450	Pentium II-450	Windows NT 4.0	64	512	10.1	integrated ATI 3D Rage Pro	4/SGRAM	17/16	not included
12	Acma ZPower 6450 PII-450	Pentium II-450	Windows 98	128	512	10.1	Real 3D StarFighter AGP	8/SGRAM	17/16.1	V.90
13	Premio Apollo BX 450	Pentium II-450	Windows 98	128	512	10.2	Matrox Millennium G200	8/SGRAM	17/16	V.90
14	HP Vectra VL Series 8 HE	Pentium II-450	Windows 98	64	512	10.1	integrated Matrox G200	8/SGRAM	17/16	not included
15	Quantex QP6/450 SM-4x SE	Pentium II-450	Windows 98	128	512	16.8	STB Velocity 4400	16/SDRAM	19/18	V.90
16	IBM PC 300 PL	Pentium II-450	Windows 98	64	512	9.1	Matrox Millennium G200	8/SGRAM	17/16	not included
17	Compaq Prosignia Desktop 330	Pentium II-450	Windows 98	128	512	16.8	STB Velocity 4400	16/SDRAM	17/16	V.90
18	Compaq Deskpro EP 6450	Pentium II-450	Windows 98	64	512	10	Matrox Millennium G200	4/SGRAM	17/16	K56flex
19	NexTrend NexStar-450 PWJ	Pentium II-450	Windows 98	128	512	14	STB Velocity 12Bzx	8/SGRAM	19/18.2	V.90
20	MidWest Micro Office Pro 450	Pentium II-450	Windows 98	128	512	13.6	STB Velocity 4400	16/SDRAM	19/18	K56flex

* Best Buy

[1] *PC World* defines towers as taller than 20 inches, midtowers as 15.5 inches to 20 inches, and minitowers as shorter than 15.5 inches.

[2] Five years on CPU and main RAM, three years on other parts.

[3] Tested with 8MB of video RAM; now comes standard with 16MB.

nal storage slots. The system comes with floppy, Zip, and DVD-ROM drives; the ports on its back are helpfully color-coded; and the midtower case opens easily to reveal a tidily arranged interior with plenty of open drive bays, card slots, and DIMM sockets.

The Millennia 400 Max's Diamond Fire GL 1000 Pro AGP card delivers snappy graphics, but the 17-inch monitor is less impressive: Images appeared washed out and a bit fuzzy at the edges. The bundled Advent AV390PL speakers and subwoofer are sufficient for common business use, but you have to crank up the volume to get any bass out of the subwoofer. Micron also bundles Microsoft Office 97 Small Business Edition and an x2 56-kbps modem from 3Com.

Beyond information on individual components, documentation is sparse. Micron offers 24-hour phone support and a five-year warranty on CPU and RAM, but the company covers labor for only one year.

3 GATEWAY GP6-450

PRO: Good performance, includes network card and modem, easy setup

CON: No DVD-ROM drive

With a price of $2314—$179 lower than last month—and a respectable PC WorldBench 98 score of 213, the GP6-450 balances affordability with solid performance. Ultimately, the GP6-450 is built for business, packing both a 56-kbps modem and an ethernet card that's ready to plug into a cable modem or small business network. It also ships with a 19-inch monitor—great for really large spreadsheets—but lacks a DVD-ROM drive; our test system included a 13X–32X CD-ROM drive instead.

During the PC World Test Center's 2D tests, the GP6-450 delivered high frame rates, guaranteeing sharp business presentations. The system's Altec Lansing speakers are okay for casual music listening but lack extended bass and treble.

Gateway systems tend to be easy to set up and use, and the GP6-450 is no exception. Color-coded ports make plugging in cables a breeze, and terrific documentation smooths out installation rough spots. The intuitive monitor and multimedia controls include such welcome extras as audio adjustments and programmable application-launching keyboard buttons.

		EXPANDABILITY					CUSTOMER SUPPORT			
CD/DVD-ROM drive speed	Sound board	Case style [1]	Max. RAM (MB)	Open RAM sockets	Open drive bays (ext./int.)	Open slots	Warranty for parts/labor (years)	Weekday toll-free support (hours)	Weekend support	Online support
14X-32X	integrated Yamaha OPL3	midtower	384	2	2/1	7	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
4X DVD-ROM	integrated Crystal PnP	midtower	384	2	2/1	4	varies [2]/1	24	Sat., Sun.	BBS, CIS, WWW
13X-32X	Creative Audio PCI 64V	midtower	384	2	3/2	3	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
4.8X DVD-ROM	Turtle Beach Montego	midtower	768	2	2/1	2	3/1	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
13X-32X	Sound Blaster Audio PCI 64V	midtower	384	2	3/2	3	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
14X-40X	Aureal A3D PCI	midtower	384	2	3/1	3	varies [2]/3	24	Sat., Sun.	BBS, WWW
2X DVD-ROM	Aztech PCI 338-A3D	midtower	1024	3	3/1	3	1/5	24	Sat., Sun.	WWW
14X-32X	integrated Crystal PnP	midtower	384	2	3/1	4	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
12X-32X	integrated Crystal PnP	midtower	384	2	2/1	5	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
17X-40X	Sound Blaster AWE64	midtower	1024	3	3/2	4	varies [4]/5	24	Sat., Sun.	WWW
20X-32X	Aztech AZT2320	midtower	384	2	3/0	3	3/90 days	24	Sat., Sun.	AOL, CIS, WWW
12X-32X	integrated Crystal PnP	midtower	384	2	0/1	3	3/1	24	Sat., Sun.	BBS, WWW
2X DVD-ROM	Sound Blaster AWE64	midtower	1024	3	3/2	3	3/3	9	none	BBS, WWW
12X-32X	Aztech AZT2320	minitower	384	2	2/1	4	3/1	[5]	none	AOL, BBS, CIS, WWW
4.8X DVD-ROM	Creative Audio PCI 64V	midtower	768	1	2/3	4	3/1	24	Sat., Sun.	BBS, WWW
14X-32X	integrated Crystal PnP	desktop	384	2	1/0	4	3/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
12X-40X	Creative Ensoniq 1371	midtower	384	2	1/1	2	3/1	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
12X-32X	integrated ESS 1B69	desktop	384	2	0/1	3	3/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
2X DVD-ROM	Sound Blaster PCI 12B	midtower	1024	2	1/1	3	3/3	24	Sat., Sun.	none
17X-40X	Sound Blaster PCI 12B	midtower	768	2	2/1	4	varies [2]/3	24	Sat., Sun.	BBS, WWW

[4] Six years on CPU and main RAM, three years on other parts.

[5] HP's offering of 11 hours of weekday support is not toll-free.

Gateway GP6-450

Three open slots ensure trouble-free expandability, and if the 10GB hard drive begins to fill up, you can use one of the three free externally accessible drive bays to add a second hard disk, a Zip drive, or a tape backup unit.

When the system is configured with 64MB of RAM, the tall midtower's roomy interior includes two free memory sockets, though you might want to order yours with 128MB, since doubling the RAM can cost as little as $100.

Bundled with the GP6-450 are three extremely useful software titles for small-office/home-office use: Microsoft's Bookshelf 98, Expedia Streets 98, and Office 97 Small Business Edition. In our recent reliability and service survey, *PC World* subscribers rated the reliability of Gateway's business PCs highly, but the company earned only fair marks for service, as readers reported long waits for tech support. In our anonymous calls to Gateway's 24-hour line, however, our average wait was between 5 and 10 minutes, and the courteous reps gave good advice.

4 DELL DIMENSION XPS R450

PRO: Impressive performance, extensive features including high-quality 4.8X DVD-ROM drive and MPEG 2 playback

CON: Modem is not V.90 standard

If you're venturing away from the corporate fold, Dell's latest Windows 98 midtower is a terrific choice. At $2529 it isn't a pocket-change purchase, but its fast performance, multimedia features, and strong reliability and support make it one of our top picks for power-hungry small or home businesses.

This Dimension sports Intel's 450-MHz Pentium II, and it shows: The R450 loads Microsoft Word and Internet Explorer on the screen almost instantly, chalking up a PC WorldBench 98 score of 212. File junkies and pack rats will benefit from the spacious 10GB hard drive.

Multimedia capability is one of this system's strengths. The DVD video output is as smooth as a baby's forehead, thanks to the XPS R450's effective MPEG 2 playback, substantial 128MB of RAM, and 17-inch Trinitron monitor. Even with half a dozen apps churning away in the ▶

background, playback remained flawless. The included Turtle Beach Montego sound card and Altec Lansing ACS295 speaker-subwoofer combination offer powerful sound with a crystal-clear tone. Just make sure you have enough space under your desk to accommodate the subwoofer, which is approximately the size of a small microwave oven.

Besides price, the only nit we found to pick involves the system's x2-standard 56-kbps modem. Unlike many of its competitors, Dell has yet to equip its PCs with modems built to the global V.90 standard. In every other respect, though, the Dimension XPS R450 is a well-built, well-documented system. Dell backs it with a support policy that includes 24-hour telephone support seven days a week, and our readers rate Dell's system reliability as good.

Dell Dimension XPS R450

5 GATEWAY E-4200 450

PRO: Comprehensive warranty and support, sharp 19-inch monitor, remote management

CON: A bit slow for a PII-450 PC, difficult-to-access memory.

Gateway's corporate powerhouse, the E-4200 450, delivers solid performance at a competitive price. Like all the PCs in Gateway's E series, it's designed for corporate IS departments that are building networks of managed PCs. You get DMI 2.0 compliance ▶

TOP 20 POWER DESKTOPS

TEST REPORT

	SYSTEM	CPU	Operating system	RAM (MB)	Secondary cache (KB)	PC WorldBench 98 score
1	Dell OptiPlex GX1 400*	Pentium II-400	Win NT 4.0	64	512	244
2	Micron Millennia 400 Max*	Pentium II-400	Win 95	64	512	210
3	Gateway GP6-450*	Pentium II-450	Win 98	64	512	213
4	Dell Dimension XPS R450*	Pentium II-450	Win 98	128	512	212
5	Gateway E-4200 450*	Pentium II-450	Win 98	128	512	204
6	MidWest Micro Business Solutions 400	Pentium II-400	Win NT 4.0	128	512	233
7	Polywell Poly 8450 B5	Pentium II-450	Win 98	128	512	224
8	NEC Direction SP B450	Pentium II-450	Win 98	64	512	220
9	NEC PowerMate 8100	Pentium II-450	Win 95	64	512	218
10	Sys Technology Performance Pro 450	Pentium II-450	Win 98	128	512	222
11	HP Brio 8500 PII-450	Pentium II-450	Win NT 4.0	64	512	263
12	Acma ZPower 6450 PII-450	Pentium II-450	Win 98	128	512	217
13	Premio Apollo BX 450	Pentium II-450	Win 98	128	512	214
14	HP Vectra VL Series 8 HE	Pentium II-450	Win 98	64	512	216
15	Quantex QP6/450 SM-4x SE	Pentium II-450	Win 98	128	512	213
16	IBM PC 300 PL	Pentium II-450	Win 98	64	512	219
17	Compaq Prosignia Desktop 330	Pentium II-450	Win 98	128	512	210
18	Compaq Deskpro EP 6450	Pentium II-450	Win 98	64	512	214
19	NexTrend NexStar-450 PWJ	Pentium II-450	Win 98	128	512	218
20	MidWest Micro Office Pro 450	Pentium II-450	Win 98	128	512	210

*Best Buy

Word 97 · Word Pro 97 · Excel 97 · 1-2-3 97 · Paradox 8.0 · Picture Publisher 7.0

TEST PC WORLD CENTER **HOW WE TEST** All systems are tested with PC WorldBench 98, *PC World's* application-based benchmark. A higher PC World8ench score is better. All PCs are tested with Windows 95, Windows 98, or Windows NT 4.0, and video resolution is set to 800 by 600 in 65,536 colors. We run automated scripts on six popular business applications, performing common tasks such as spelling checks, scrolls, saves, sorts, and recalculations. The PC World8ench 98 score is a sum of the weighted, normalized result of each script: Word 97 (10 percent), Word Pro 97 (10 percent), Excel 97 (20 percent), 1-2-3 97 (20 percent), Paradox 8.0 (20 percent), and Picture Publisher 7.0 (20 percent). For more details on our benchmark and how we run it, see PC World Online (www.pcworld.com/testing). [1]Under Windows 98.

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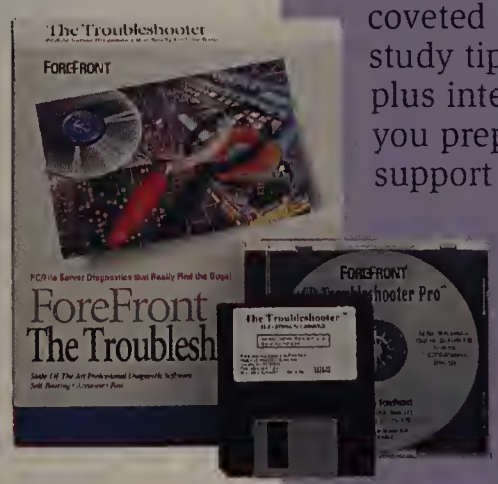
- Troubleshooting training—includes McGraw-Hill's easy-to-follow guides on troubleshooting and interactive computer-aided electronics diskettes relating to four key areas: AC electronics, DC electronics, semiconductors, and electronic circuits.
- Windows 98—this long-awaited version of Windows has more power, a new Web look, e-mail capabilities, single-click functionality, and System File Checker.



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and a 3Com Fast EtherLink XL network adapter as standard equipment. Toss in a 19-inch monitor, and the $2399 price is a bargain. As with most corporate PCs, however, a modem costs extra.

Gateway E-4200 450

If you're searching for cutting-edge performance, you had best look elsewhere. This computer's PC WorldBench 98 score of 204 is higher than most PCs', but low for a Pentium II-450.

Though not a stylish as Gateway's G or GP machines, the E-4200 has a nice overall exterior design and easy-to-find ports on the back of the PC. Gateway's VX900 19-inch monitor, combined with ATI's Rage Pro Turbo graphics adapter, displayed clear text and brilliant images.

A chassis intrusion switch alerts IS of forced break-ins, while thumb screws make the case easy for users to open. Our system included five open drive bays, two free DIMM sockets, and three unused expansion slots—more than enough for most upgrade needs. The only major flaw is the location of the memory sockets, which are buried behind the case's internal power cables.

Gateway offers free 24/7 telephone tech support, and its three-year warranty on parts and labor qualifies as one of the most generous in the industry. Gateway's marks in our reliability and service survey were only fair, but in answering our anonymous calls, the company's support reps were knowledgeable, courteous, and helpful.

New This Month

The following systems made our Power Desktops chart for the first time this month. For brief reviews of previously tested machines on the chart, visit our Web page (www.pcworld.com/top400).

15 QUANTEX QP6/450 SM-4X SE

PRO: Excellent speakers and graphics card, attractive software bundle, 4.8X DVD-ROM drive

CON: Mediocre monitor, confusing reset button

Quantex's QP6/450 SM-4x SE takes an entirely different approach from Gateway's corporate-oriented E-4200 450. As part of Quantex's high-end multimedia line, the QP6/450 SM-4x SE should appeal more to power users running their own businesses. Fast graphics, a 4.8X DVD-ROM drive, great speakers, lots of extras, and a moderate $2499 price distinguish this Quantex system.

But stylish it's not. The large square chassis has a utilitarian look. It also has one annoying feature: It's difficult to tell at first glance which of the two buttons on the front panel is for power and which is for system reset. Clearly, though, Quantex put its dollars behind such highly desirable extras as a Zip drive, a V.90 56-kbps modem, and a 4.8X DVD-ROM drive. For multimedia tasks, STB's Velocity 4400 graphics board (powered by NVidia's hot TNT chip) gives you great 2D and 3D graphics, and Altec Lansing's ADA305 Digital PowerCube speaker set delivers terrific sound. The one unimpressive component is the 19-inch Quantex monitor, which displayed somewhat pixelated images.

QP6/450 SM-4x SE

The software bundled with the system targets personal productivity. In addition to Microsoft's Office 97 Small Business Edition, Quantex tosses in packages like Softkey Labels Unlimited and Softkey Day Planner.

If you need to upgrade this PC, getting inside the case is relatively easy, and a generous array of four open slots and five open drive bays is available. There's only one open memory socket, but that should not limit most users, since the system comes with 128MB of RAM.

On the other hand, the documentation included with the QP6-450 SM-4x SE is woefully inadequate. It covers the basics but doesn't drill down any specifics about the machine. If you run into trouble, you'll probably end up calling Quantex's toll-free tech support line, which fortunately is open 24 hours every day of the week. Based on our anonymous calls, the quality of support seems to be adequate.

17 COMPAQ PROSIGNIA DESKTOP 330

PRO: Direct-purchase model from Compaq with unusual service options for small-business support, network interface card and modem

CON: Pricey for a direct-purchase system, case requires special tools to open, messy interior

Compaq aims to distinguish itself amid the crowd of direct vendors by offering the Prosignia Desktop 330. But the main reason most people buy direct is price, and the Prosignia, at $2429, is no bargain for a direct-purchase system. For a mere $70 more, Quantex's QP6/450 SM-4x SE has many more high-end components.

Prosignia Desktop 330

True to its business focus, the Prosignia Desktop 330 has a basic configuration: a V.90 56-kbps modem, a crisp 17-inch monitor, a network card, and plenty of memory and hard drive space. The Prosignia's PC WorldBench score of 210 is slightly below average for a Pentium II-450 system.

The Prosignia Desktop 330 also comes with a somewhat unusual list of extra-cost small-business support services, such as online backup, secure online document delivery, and assistance in establishing an online storefront.

Our biggest problem with the Prosignia Desktop 330 is its case design. You need to buy a set of specialized Torx screwdrivers just to get inside. Moreover, the sloppily organized power cables, which are situated next to the I/O slots, make adding DIMMs a chore. In our anonymous calls to Compaq's technical support line, we received adequate advice but had to wait on hold 20 minutes each time. ▶

BEYOND THE TOP 20

We evaluated the following systems along with the others, but they didn't score high enough to reach the *Top 20 Power Desktops* chart. For write-ups, go to PC World Online (www.pcworld.com/t20pcs).

- **NexTrend NexStar 450 TNT**
- **Aberdeen Inverness D27 PII-450**
- **Cyberdyne Centron 450 BM**
- **Kingdom Pinnacle 450**
- **Tagram T5700 PII-450**
- **NexTrend NexStar 700**

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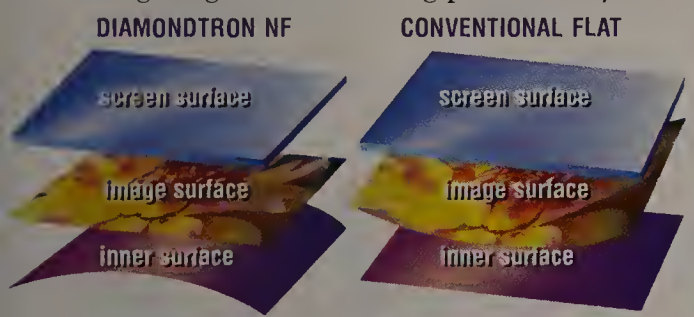

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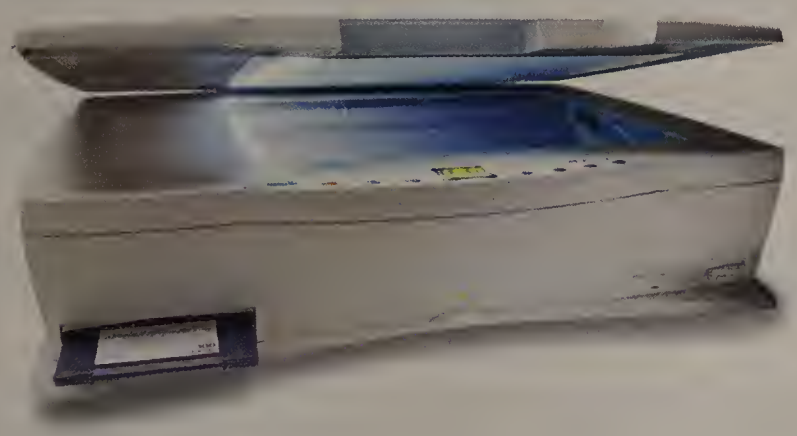

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PC WORLD

TOP 20 BUDGET DESKTOPS

	SYSTEM	Last month	Month tested	Street price (11/20/98)	CPU	Comments
1	Gateway E-3200 400 800/779-2000 www.gateway.com	2	Dec 98	$1813	Pentium II-400	Fully manageable corporate PC has network card, great support policies.
2	Micro Express MicroFlex C400B 800/989-9900 www.microexpress.net	4	Jan 99	$1699	Pentium II-400	Low price for a PII-400; plenty of RAM, DVD-ROM drive, mediocre monitor.
3	Micro Express MicroFlex-35A 800/989-9900 www.microexpress.net	1	Dec 98	$1199	AMD K6-2-350	Moderately fast PC includes robust multimedia components and a great warranty.
4	Dell Dimension V333c 800/388-8542 www.dell.com	6	Nov 98	$1629	Celeron-333	Big $220 cut, but still pricey for its class; Zip drive and 4.8X DVD-ROM drive.
5	Dell Dimension XPS R350 800/388-8542 www.dell.com	3	Nov 98	$1899	Pentium II-350	Great all-around PC for small business includes 4.8X DVD-ROM drive.
6	Micron ClientPro 400 888/634-8799 www.micronpc.com	n/a	Oct 98	$1999	Pentium II-400	Network-ready with built-in management; delivers average PII-400 performance.
7	CyberMax Enthusiast KII 350 800/437-4596 www.cybermaxpc.com	n/a	NEW	$1149	AMD K6-2-350	Feature-rich PC offers loads of expandability but has a poor monitor.
8	Axis Systems Orion 100R PII-400 800/378-9014 www.axissys.com	7	Jan 99	$1799	Pentium II-400	Fast PC with 4.8X DVD-ROM gets $200 price cut, improved tech support.
9	Sys Technology TaskMaster 350K2 800/613-9963 www.sys.com	13	Jan 99	$1559	AMD K6-2-350	Cut of $140 on PC that's fast for an AMD K6-2-350; 17X-40X CD-ROM drive.
10	MidWest Micro Office Pro 350 800/728-8582 www.mwmicro.com	n/a	NEW	$1499	Pentium II-350	Average-price PC benefits from DVD-ROM drive and strong warranty.
11	Quantex QP6/400 SM-1x 800/896-4898 www.quantex.com	n/a	Sept 98	$1950	Pentium II-400	Affordable PII-400 with 19-inch monitor and great support.
12	Compaq Deskpro EP C333 800/345-1518 www.compaq.com	9	Nov 98	$1729	Celeron-333	Well-configured corporate PC is steep for a Celeron-333 system.
13	NEC Direction SP B350 888/863-2669 www.necnow.com	n/a	NEW	$1299	Pentium II-350	Inexpensive PC is slow for its class, with so-so peripherals; lots of expansion room.
14	IDot.com 450 BX 888/388-4368 www.idot.com	20	Jan 99	$1798	Pentium II-450	Former Entrepreneur BX450 is $200 less, now has 32-bit sound, V.90 56-kpbs modem.
15	Quantex QP6/400 M-2X 800/896-4898 www.quantex.com	n/a	NEW	$1949	Pentium II-400	Small-business/home-office PC is multimedia-savvy but pricey; mediocre monitor.
16	Unicent Avanta E333 800/308-3614 www.unicent.com	11	Nov 98	$999	Celeron-333	Cheapest system on chart could have better phone support.
17	PowerSpec MT 6320 PII-350 888/480-3353 www.powerspec.com	19	Jan 99	$1298	Pentium II-350	PII-350 packs good speed and includes satisfactory components.
18	Acma NPower 6350 PII-350 800/786-6888 www.acma.com	n/a	NEW	$1895	Pentium II-350	Corporate PC has Zip drive, network card, and good support; pricey for its CPU class.
19	NextPC N6-350 PII 350 888/838-7827 www.next-pc.com	n/a	Oct 98	$1429	Pentium II-350	Fast small-office system benefits from $139 price cut but lacks online support.
20	ProGen Polaris PII-450 888/776-9595 www.progen.com	n/a	Jan 99	$1499	Pentium II-450	ProGen slashes $380 off sluggish PC with MS Natural Keyboard and Intellimouse.

Best Buy See features chart, page 204; test report, page 206.

n/a = not applicable

[1] A system's performance word score is relative to scores of other PCs running the same operating system. For more details see "Your Guide to the Top 100" on page 191.

[2] For more information about all products in this table, select PC World InfoNet no. 907 or visit www.pcworld.com/infonet.

THIS MONTH'S BUDGET SYSTEMS range in price from the bare-bones, 16th-place Unicent Avanta E333 at $999 to the Micron ClientPro 400, which barely missed winning a Best Buy at $1999. Price cuts have turned former power-chart contestants like the ClientPro and the NextPC N6-350 into affordable budget machines. But of the budget Best Buys, only the Micro Express MicroFlex-35A comes in at under $1600, indicating that cheapness alone won't boost a system to the top. The seventh-place CyberMax Enthusiast KII 350 is our top-rated new system this month, thanks to a big 8.4GB hard disk, a DVD-ROM drive, and a low $1149 price. Slow performance and a poor monitor keep it from rising higher.

SCORECARD

★ Overall rating	PC WorldBench 98/operating system	Features and design	Price	Performance [1]	Vendor's system reliability	Vendor's support quality/policies	PC World InfoNet number [2]
83	224/Win NT 4.0	good	expensive	very good	good	fair/outstanding	668
83	204/Win 98	very good	average	very good	[3]	fair [4]/outstanding	669
83	179/Win 98	good	inexpensive	good	[3]	fair [4]/outstanding	670
82	170/Win 98	good	average	good	good	good/good	671
82	188/Win 98	good	expensive	good	good	good/good	672
80	228/Win NT 4.0	good	expensive	very good	good	good/good	673
80	161/Win 98	good	inexpensive	satisfactory	[3]	fair [4]/good	674
80	201/Win 98	very good	expensive	very good	[3]	fair [4]/good	675
80	181/Win 98	very good	average	good	[3]	good [4]/good	676
78	181/Win 98	very good	average	good	[3]	good [4]/good	677
78	199/Win 95	very good	expensive	very good	[3]	fair [4]/good	678
77	176/Win 98	good	expensive	good	good	fair/outstanding	679
77	170/Win 98	satisfactory	average	good	outstanding	good [4]/good	680
77	218/Win 98	very good	expensive	outstanding	[3]	good [4]/poor	681
75	199/Win 98	very good	expensive	very good	[3]	good [4]/good	682
75	171/Win 98	satisfactory	inexpensive	good	[3]	fair [4]/outstanding	683
74	180/Win 98	good	average	good	[3]	fair [4]/fair	684
74	188/Win 98	good	expensive	good	[3]	good [4]/good	685
74	181/Win 95	good	average	good	[3]	fair [4]/good	686
73	206/Win 98	good	average	very good	[3]	poor [4]/fair	687
Scorecard weightings ▶		Features 25 percent	Price 22 percent	Performance 18 percent	Reliability 15 percent	Quality/policies 10 percent each	

[3] Insufficient data to give a rating.

[4] Scores were derived from anonymous support-quality calls due to insufficient data from survey.

This Month's Best Buys

1 GATEWAY E-3200 400

PRO: Well-supported corporate PII-400 system with easy-access interior

CON: Limited expandability, mediocre monitor

Corporate PC buyers looking for a high-quality managed PC for less than $2000 should seriously consider Gateway's E-3200 400 desktop. For $1813 you get a network-ready computer that's easy to service and has built-in remote management hardware. Performance isn't the E-3200 400's strongest suit, however. Despite the PC's speedy Pentium II-400 processor and Windows NT 4.0 operating system, it turned in a PC WorldBench 98 score of 224—about 6 percent lower than those of similarly configured Windows NT–equipped systems, whose scores averaged 234.

But the E-3200 400 compensates for its less-than-thoroughbred gait with smart remote management features and a clever modular design. The motherboard packs DMI 2.0 and Intel LANDesk Client Manager software, which enables IS personnel to monitor the computer remotely. Such powerful management tools make the E-3200 400 a good fit for small companies that want more control over their fleet of PCs and for large businesses looking to outfit an entire division.

Gateway E-3200 400

The E-3200 400's design also makes it remarkably easy to service. Normally tedious tasks that involve removing the case cover and exchanging a component (whether system memory or the processor) require very little time and very few tools. You have unimpeded access to the memory and expansion slots, and you can even remove and replace the entire motherboard in less than a minute. Best of all, putting the pieces back together is as straightforward as taking them apart. Color-coded cables for the keyboard, mouse, and monitor make it a cinch to get the system running again.

This Gateway's components, though not state-of-the-art, suffice for general business applications. The motherboard integrates a Crystal PnP sound chip and an ATI 3D Rage Pro AGP graphics chip, but you can install an additional 4MB of video memory if you need it. The 17-inch Gateway EV700 monitor offers unremarkable display quality for images and text. But image adjustments are easy enough: A flywheel control lets you change on-screen settings by turning a knob. The E-3200 400 also comes with a pair of unexceptional Altec Lansing GCS speakers, but multimedia isn't a priority for this PC. If you must have better speakers, you can pay $30 more for the superior Boston Acoustics BA635 sound system.

The PC is backed by a generous three-year warranty on both parts and labor, and by around-the-clock tech support ▶

TOP 20 BUDGET DESKTOPS — STANDARD FEATURES

	SYSTEM	CPU	Operating system	RAM (MB)	Secondary cache (KB)	Hard drive (GB)	Graphics adapter (AGP)	Video RAM (MB/type)	Monitor tube/ viewable diagonal (inches)	56-kbps modem protocol
1	Gateway E-3200 400*	Pentium II-400	Windows NT 4.0	64	512	10	integrated ATI 3D Rage Pro	4/SGRAM	17/15.9	not included
2	Micro Express MicroFlex C400B*	Pentium II-400	Windows 98	128	512	10	ATI Xpert@Work	8/WRAM	17/16.1	K56flex
3	Micro Express MicroFlex-35A*	AMD K6-2-350	Windows 98	64	1024	7.5	Diamond Viper V330	4/SGRAM	17/15.9	K56flex
4	Dell Dimension V333c*	Celeron-333	Windows 98	64	128	8.4	integrated ATI 3D Rage Pro	8/SDRAM [2]	17/15.9	x2
5	Dell Dimension XPS R350*	Pentium II-350	Windows 98	64	512	10	STB Velocity 128zx	8/SGRAM [2]	17/16	x2
6	Micron ClientPro 400	Pentium II-400	Windows NT 4.0	128	512	6.4	Diamond Viper V330	4/SGRAM	17/16	not included
7	CyberMax Enthusiast KII 350	AMD K6-2-350	Windows 98	64	512	8.4	Mpact II AGP	8/RDRAM	17/15.8	K56flex
8	Axis Systems Orion 100R PII-400	Pentium II-400	Windows 98	64	512	10	Matrox Millennium G200	8/SGRAM	17/16	V.90
9	Sys Technology TaskMaster 350K2	AMD K6-2-350	Windows 98	64	512	10.1	Matrox Millennium G200	8/SGRAM	17/15.8	V.90
10	MidWest Micro Office Pro 350	Pentium II-350	Windows 98	64	512	6.4	ATI Xpert@Play 98	8/SGRAM	17/15.8	K56flex
11	Quantex QP6/400 SM-1x	Pentium II-400	Windows 95	64	512	11	Real 3D StarFighter AGP	8/SGRAM	19/18	K56flex
12	Compaq Deskpro EP C333	Celeron-333	Windows 98	64	128	10	Matrox Millennium G200	8/SDRAM	17/15.9	K56flex
13	NEC Direction SP B350	Pentium II-350	Windows 98	32	512	4.3	ATI Xpert98	8/SGRAM	15/13.9	K56flex
14	IDot.com 450 BX	Pentium II-450	Windows 98	64	512	10.1	Matrox Millennium G200	8/SGRAM	17/16.1	V.90
15	Quantex QP6/400 M-2X	Pentium II-400	Windows 98	64	512	8.4	Diamond Fire GL 1000 Pro	8/SGRAM	19/17.9	V.90
16	Unicent Avanta E333	Celeron-333	Windows 98	64	128	4	integrated ATI 3D Rage Pro	4/SGRAM	15/13.7	V.90
17	PowerSpec MT 6320 PII-350	Pentium II-350	Windows 98	64	512	6.4	Permedia 2	4/SGRAM	17/15.9	V.90
18	Acma NPower 6350 PII-350	Pentium II-350	Windows 98	64	512	10.1	Diamond Stealth II G460	8/SDRAM	17/16	V.90
19	NextPC N6-350 PII 350	Pentium II-350	Windows 95	64	512	8.4	Card Expert Intel740	8/SDRAM	17/16	K56flex
20	ProGen Polaris PII-450	Pentium II-450	Windows 98	64	512	8.4	Matrox Millennium G200 AGP	8/SDRAM	17/16	V.90

* Best Buy

[1] *PC World* defines towers as taller than 20 inches, midtowers as 15.5 inches to 20 inches, and minitowers as shorter than 15.5 inches.

every day of the week. In our survey, readers rated the reliability of Gateway's business systems as good; and in responding to our anonymous calls, the company's representatives provided acceptable answers to our questions.

2 MICRO EXPRESS MICROFLEX C400B

PRO: Generous amount of memory, 3X DVD-ROM drive, good technical support policies

CON: Difficult-to-remove cover, mediocre monitor, outdated documentation

The Micro Express MicroFlex C400B, formerly known as the C400A, jumps from fourth place to second this month. At $1699, this Pentium II-400 PC is less expensive than many of its similarly configured peers. It also comes with solid multimedia features, offers good upgrade potential, and carries generous warranty and tech support policies.

MicroFlex C400B

The new MicroFlex earned a PC WorldBench score of 204, which is about average for its processor and price class. But it packs 128MB of memory—double what most comparably priced units have—and such multimedia perks as a 3X DVD-ROM drive, S-video, and RCA cables. It also boasts a MIDI port, along with a set of Altec Lansing PowerCube speakers that are backed by a robust subwoofer and powered by a superior Creative Labs Sound Blaster PCI 128 sound card. The 17-inch Impression 7 Plus monitor is easy to adjust, thanks to straightforward hardware controls and a helpful on-screen menu. In our tests, text and graphics looked sharp, but the corners of the screen tended to be fuzzy.

Upgrading the system is easy. But as with most MicroFlex midtowers, getting inside means you must remove four screws and then lift off an awkward three-sided cover. Once you've cracked the case, you'll find plenty of room to move around in—and no nasty cable clutter. Unfortunately, putting the cover back on is as inconvenient as taking it off. You get numerous manuals with the system, but the outdated owner's guide, designed for Windows 3.1 users, contains nary a word about Windows 98.

		EXPANDABILITY					CUSTOMER SUPPORT			
CD/DVD-ROM drive speed	Sound board	Case style[1]	Max. RAM (MB)	Open RAM sockets	Open drive bays (ext./int.)	Open slots	Warranty for parts/labor (years)	Weekday toll-free support (hours)	Weekend support	Online support
13X-32X	integrated Crystal PnP	desktop	384	2	1/1	1	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
3X DVD-ROM	Sound Blaster PCI 12B	midtower	384	1	3/0	4	4/4	24	Sat., Sun.	WWW
12X-32X	Sound Blaster PCI 12B	midtower	384	4	3/0	4	4/4	24	Sat., Sun.	WWW
4.8X DVD-ROM	Turtle Beach Montego	minitower	384	2	2/1	1	3/1	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
4.8X DVD-ROM	integrated Crystal PnP	midtower	384	2	3/1	4	3/1	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
20X-32X	integrated Crystal PnP	midtower	384	2	3/1	4	varies [3]/1	24	Sat., Sun.	BBS, CIS, WWW
2X DVD-ROM	Sound Blaster AWE64	midtower	256	1	3/3	4	3/1	24	Sat., Sun.	BBS, WWW
4.8X DVD-ROM	Sound Blaster PCI 12B	midtower	384	2	2/0	4	3/3	24	Sat., Sun.	WWW
17X-40X	Sound Blaster AWE64	midtower	768	2	3/2	4	3/5	24	Sat., Sun.	WWW
4.8X DVD-ROM	Sound Blaster AWE64D	midtower	768	2	3/1	4	varies [3]/3	24	Sat., Sun.	BBS, WWW
12X-32X	Ensoniq AudioPCI	midtower	384	2	3/3	3	3/1	24	Sat., Sun.	BBS, WWW
12X-32X	Compaq Premiere Labs	desktop	256	1	1/1	3	3/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
14X-32X	integrated Crystal PnP	midtower	384	2	3/0	4	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
17X-40X	Aztech PCI 33BA-3D	midtower	384	2	3/0	4	varies [3]/1	24	Sat., Sun.	WWW
4.8X DVD-ROM	Creative Audio PCI 64V	minitower	384	1	2/3	3	3/1	24	Sat., Sun.	WWW
12X-24X	integrated Yamaha OPL3-Sax	minitower	256	1	2/0	2	3/3	24	Sat., Sun.	BBS, WWW
12X-32X	integrated ESS Maestro2 PCI	minitower	384	2	2/0	2	1/1	17	Sat., Sun.	BBS
13X-32X	Sound Blaster PCI 12B	midtower	384	2	1/0	2	3/1	24	Sat., Sun.	BBS, WWW
14X-36X	integrated Ensoniq AudioPCI	midtower	768	2	2/3	5	3/3	24	Sat., Sun.	none
14X-32X	Aureal Vortex PCI Audio	minitower	384	2	1/1	0	3/1	12	none	BBS, WWW

[1] Tested with 8MB of video RAM, now comes standard with 16MB.

[3] Five years on CPU and main RAM, three years on other parts.

Micro Express backs the MicroFlex C400B with an exceptionally long four-year warranty on both parts and labor and provides free 24-hour telephone technical support every day of the week.

3 MICRO EXPRESS MICROFLEX-35A

PRO: Neat interior, long warranty, good speakers

CON: Case is hard to open

Though it features a great interior design, a good audio subsystem, and a lengthy warranty, Micro Express's MicroFlex-35A couldn't hold its number one position for a second month. Nevertheless, Micro Express's MicroFlex-35A continues to offer the budget-conscious power user high-quality components, impressive performance, and an extremely attractive $1199 price.

You would pay approximately $400 more for a comparably equipped computer powered by a Pentium II-350 processor. But opting for the bargain doesn't mean that you have to sacrifice speed. Inside the MicroFlex-35A's plain beige midtower case lies a 350-MHz K6-2 processor, the fastest yet from AMD. The system's PC WorldBench score of 179 equals that of an average Pentium II-350 system.

Despite its modest price, the MicroFlex-35A doesn't skimp on hardware. The combination of a 7.5GB hard disk, a 56-kbps modem, and a 12X–32X CD-ROM drive make it suitable for most business applications. And if you build heavy-duty multimedia presentations, the included Diamond Viper V330 graphics card won't disappoint. The Viper series has fared well on our *Top 10 Graphics Boards* chart. The MicroFlex-35A's sound system is also powerful: Creative Labs' standard Sound Blaster PCI 128 audio card surrounds you with sound when it's connected to a four-speaker audio system. The card doesn't quite match Altec Lansing's ACS44 PowerCube speaker setup—two tiny but powerful cubic satellites and a subwoofer half the size of the midtower—but it still delivers great sound.

MicroFlex-35A

Though text and graphics images appeared crisp on the 17-inch Impression 7V color monitor, the display ▶

made a poor impression on us: The monitor we reviewed had a bluish cast we couldn't eliminate. The MicroFlex-35A's interior is so neat and well-organized you'd think that a drill sergeant had designed it. If only getting inside were simpler. You have to remove four Phillips-head screws, and then lift off the three-sided steel case. Reseating the cover is even trickier; we had trouble aligning it and sliding it securely back into place.

The MicroFlex-35A comes with numerous helpful manuals, and Micro Express backs its systems with an above-average four-year warranty on parts and labor, including one year of free on-site service. Toll-free phone support is available around the clock. In answers to our anonymous calls, Micro Express's technicians were helpful. They answered our easy-to-intermediate questions accurately and succinctly, but didn't bother to explain the particulars in their responses to our more difficult questions.

4 DELL DIMENSION V333C

PRO: Speed on a par with PII-333 machines, includes Zip drive and 4.8X DVD-ROM drive

CON: Still not a great bargain, even following a $220 drop in price

Dell's Dimension V333c is a small-business machine with multimedia on its mind. The Celeron-333 processor at the heart of this system helped it achieve a PC WorldBench 98 score of 170, which is competitive with PII-333 systems. But even after Dell pared

TOP 20 BUDGET DESKTOPS — TEST REPORT

	SYSTEM	CPU	Operating system	RAM (MB)	Secondary cache (KB)	PC World-Bench 98 score
1	Gateway E-3200 400*	Pentium II-400	Win NT 4.0	64	512	224
2	Micro Express MicroFlex C400B*	Pentium II-400	Win 98	128	512	204
3	Micro Express MicroFlex-35A*	AMD K6-2-350	Win 98	64	1024	179
4	Dell Dimension V333c*	Celeron-333	Win 98	64	128	170
5	Dell Dimension XPS R350*	Pentium II-350	Win 98	64	512	188
6	Micron ClientPro 400	Pentium II-400	Win NT 4.0	128	512	228
7	CyberMax Enthusiast KII 350	AMD K6-2-350	Win 98	64	512	161
8	Axis Systems Orion 100R PII-400	Pentium II-400	Win 98	64	512	201
9	Sys Technology TaskMaster 350K2	AMD K6-2-350	Win 98	64	512	181
10	MidWest Micro Office Pro 350	Pentium II-350	Win 98	64	512	181
11	Quantex QP6/400 SM-1x	Pentium II-400	Win 95	64	512	199
12	Compaq Deskpro EP C333	Celeron-333	Win 98	64	128	176
13	NEC Direction SP B350	Pentium II-350	Win 98	32	512	170
14	IDot.com 450 BX	Pentium II-450	Win 98	64	512	218
15	Quantex QP6/400 M-2X	Pentium II-400	Win 98	64	512	199
16	Unicent Avanta E333	Celeron-333	Win 98	64	128	171
17	PowerSpec MT 6320 PII-350	Pentium II-350	Win 98	64	512	180
18	Acma NPower 6350 PII-350	Pentium II-350	Win 98	64	512	188
19	NextPC N6-350 PII 350	Pentium II-350	Win 95	64	512	181
20	ProGen Polaris PII-450	Pentium II-450	Win 98	64	512	206

*Best Buy

Word 97 · Word Pro 97 · Excel 97 · 1-2-3 97 · Paradox 8.0 · Picture Publisher 7.0

TEST PC WORLD CENTER

HOW WE TEST All systems are tested with PC World8ench 98, *PC World's* application-based benchmark. A higher PC World8ench score is better. All PCs are tested with Windows 95, Windows 98, or Windows NT 4.0, and video resolution is set to 800 by 600 in 65,536 colors. We run automated scripts on six popular business applications, performing common tasks such as spelling checks, scrolls, saves, sorts, and recalculations. The PC World8ench 98 score is a sum of the weighted, normalized result of each script: Word 97 (10 percent), Word Pro 97 (10 percent), Excel 97 (20 percent), 1-2-3 97 (20 percent), Paradox 8.0 (20 percent), and Picture Publisher 7.0 (20 percent). For more details on our benchmark and how we run it, see PC World Online (www.pcworld.com/testing). [1]Under Windows 98.

$220 off its price tag, the $1629 V333C remains more expensive than its Celeron-333–powered peers—probably due to multimedia extras including a Zip drive and a 4.8X DVD-ROM drive.

Dell Dimension V333c

Dell's setup and user guides are comprehensive, and color-coded cables that match the well-labeled ports on the back of the case make initial setup a no-brainer. The warranty on this system is the same as for all Dimensions: Parts are covered for three years, labor for one. Toll-free technical support is available 24 hours every day of the week. In responses to our anonymous tech support calls, representatives answered our questions adequately.

5 DELL DIMENSION XPS R350

PRO: Ties for fastest PII-350 we've tested, DVD-ROM drive, huge hard disk, Trinitron monitor

CON: Pricey, case is difficult to open

Dell's $1899 Dimension XPS R350 comes with all the goodies you'll find in more expensive peers. And this Pentium II-350 turns in a PC WorldBench score of 188, tying it for first among systems we've tested in its processor class.

The system includes a robust 10GB IBM ATA-33 hard disk, an Iomega Zip drive, and a 4.8X DVD-ROM drive. The stunning 17-inch Trinitron monitor, fast STB Velocity 128zx graphics card, and hardware-based MPEG 2 decoder deliver blazing graphics and video. The software bundle, anchored by Microsoft Office Small Business Edition, is all business.

The XPS R350's midtower case includes a platform base for extra stability, but the side panel is hard to remove. The well-arranged interior includes a fan that blows air directly onto the heat sink.

Dell's helpful documentation includes a foldout setup guide and troubleshooting manuals. Our readers rate Dell's 24-hour toll-free tech support as good. Reps were polite during our anonymous calls, but unwilling to help us without system identification numbers. Additionally, they gave incorrect advice when we asked difficult questions about FAT32 and updating drivers.

Dell Dimension XPS R350

New This Month

The following systems made our Budget Desktops chart for the first time this month. For brief reviews of previously tested machines on the chart, visit our Web page (www.pcworld.com/top400).

7 CYBERMAX ENTHUSIAST KII 350

PRO: Great set of features for the price

CON: Poor monitor quality

It's astounding how much computer a little over a grand will buy you these days. For just $1149, CyberMax's Enthusiast KII 350 offers such features as a DVD-ROM drive and a 17-inch monitor along with plenty of expandability and acceptable performance.

Enthusiast KII 350

The Enthusiast, powered by AMD's K6-2-350 processor, scored 161 on our PC WorldBench 98 test suite, on a par with systems running on Pentium II-300 CPUs. Its performance is also about average for computers priced under $1200—so speed shouldn't be your first, or even second, priority if you are considering this machine.

The 17-inch CyberMax monitor bundled with this PC disappointed us. Displayed images lacked crispness, and colors seemed a bit dull. The system's sound quality, on the other hand, was quite pleasing, thanks in part to the Altec Lansing ACS 45.1 speaker and subwoofer combination. If you like to listen to music through your PC while you work, these speakers are a fine choice.

Open drive bays and adapter slots abound inside this midtower. Once we removed the screws and the sturdy casing, we found a spacious interior—and a tangle of wires. But we also found six free drive bays and four open expansion slots.

The Enthusiast ships with both a quick setup guide and a thorough system manual to get you up and running. CyberMax backs its systems with a warranty of three years on parts and one year on labor. Technical support representatives are available around the clock.

10 MIDWEST MICRO OFFICE PRO 350

PRO: DVD-ROM drive, comprehensive warranty

CON: Undersize keyboard

If you're in the market for a versatile small-business or home-office system, MidWest Micro's newly reconfigured Office Pro 350 may hit the spot. At $1499, it qualifies as the lowest priced Pentium II-350–powered PC we've seen with a 4.8X DVD-ROM drive, and is a good $100 less than the average Pentium II-350 system. With a PC WorldBench 98 score of 181 (at the median for its configuration) it commands excellent performance for the price. Microsoft's Office 97 Small Business Edition is included in the package, enabling you to get up and working quickly.

Whether you display text or graphics, the Office Pro 350 more than holds its own. The 17-inch Clearmax CM-1726 monitor, in association with the ATI Xpert@Play 98 graphics adapter, gives a sharp picture even at 1280 by 1024 resolution. The ATI adapter nicely supports Toshiba's latest-generation 4.8X DVD-ROM drive. Finally, Altec Lansing's ADA 305 Digital PowerCube speakers round out this strong multimedia package.

Office Pro 350

The easy-to-open midtower case houses four free drive bays, four open expansion slots, and two unused DIMM sockets—all with unobstructed access. In fact, just about the only main thing we disliked about this system was its small, difficult-to-use keyboard.

MidWest Micro provides a longer-than-average parts and labor warranty along with unlimited 24-hour telephone technical support. Our anonymous calls to MidWest Micro's support line were an- ▶

swered by knowledgeable representatives who went the extra mile to help us, making sure we understood their answers to our more difficult questions.

13 NEC DIRECTION SP B350

PRO: Inexpensive, plenty of room for expansion, good support

CON: Slow for its processor class; small hard drive and monitor, limited RAM

NEC's Web site touts the Direction SP B series as "superior performance systems for the power enthusiast." Speed-hungry users should look elsewhere, however. The SP B350's PC WorldBench score of 170 makes it the slowest Pentium II-350 system we've ever encountered; it trails the average PII-350 by 8 percent.

NEC Direction SP B350

Performance aside, the Direction SP B350 is a no-frills system with a relatively low price of $1299. No frills means a petite 4.3GB hard drive, 32MB of RAM, and a 15-inch monitor. That's downright lilliputian compared to other Pentium II-350 systems we've seen, which typically carry at least a 6.4GB hard drive, 64MB of RAM, and a 17-inch monitor.

The Direction heads the right way on several fronts, though, with three free PCI slots, one free ISA/PCI slot, and a clean, easy-to-access interior. And NEC systems earned an outstanding reliability score in our recent subscriber survey.

15 QUANTEX QP6/400 M-2X

PRO: Generous software bundle, built-in Zip drive, 4.8X DVD-ROM drive, and V.90 56-kbps modem

CON: Somewhat outdated graphics card; insufficient system documentation

You won't mistake Quantex's $1949 QP6/400 M-2X for an overachiever: Its price, performance, and features are all middling for its class. Highlights include a built-in Zip drive, a 4.8X DVD-ROM drive, a V.90 56-kbps modem, and an 8.4GB hard disk.

Quantex QP6/400 M-2X

Quantex seems to have used the grab-bag approach in selecting components for this general-use system. For instance, the Diamond Fire GL 1000 Pro graphics card in our review unit, despite using latest-generation technology, doesn't rate as one of the stronger boards for after-hours gaming. On the other hand, the system offers sound good enough to challenge some stereo systems, and a stack of useful software including Corel's Office Suite 8, Compton's Interactive Encyclopedia, and the American Heritage Talking Dictionary.

Getting inside the system for upgrades proves easy—just turn three thumbscrews and pull. But once you're in, you'll have to push some of the clutter aside to access any of the three free card slots or the one free DIMM socket.

Unfortunately, if you experience any problem with an upgrade, the system manual won't offer much help. The user guide includes lots of information on system tools, viruses, and multimedia, but it doesn't outline the system design or cover basic system setup. Thankfully, Quantex offers toll-free technical support around the clock, and its courteous reps provide good support. All of our anonymous calls were answered in less than 10 minutes. Quantex backs its systems with a three-year parts, one-year labor warranty.

18 ACMA NPOWER 6350 PII-350

PRO: Well-designed for the office; Zip drive; network card and modem; remote management

CON: Pricey for a Pentium II-350; second-rate graphics card and speakers

Most corporate computers on the market come from giant vendors like Compaq, Dell, and IBM. But there are some little-guy exceptions, like Acma. This company's NPower 6350 PII-350 supports DMI 2.0 remote along with a good array of special features. As with most corporate systems, however, you pay a premium for the business-oriented profile. The average Pentium II-350 machine costs $200 less than the $1895 NPower.

With a PC WorldBench 98 score of 188, the NPower 6350 PII-350 won't leave many of its users suffering from performance anxiety. Among similarly configured systems running Windows 98, the NPower earns one of the top speeds.

Office-minded extras include both a network interface card and a V.90 56-kbps modem, and, for added storage, a Zip drive (though the system comes with a voluminous 10.1GB hard drive). As is the case with many business-focused systems, the NPower's perks don't extend to state-of-the-art multimedia components such as a DVD-ROM drive—instead, you get a 13X-32X CD-ROM drive.

NPower 6350 PII-350

The 17-inch monitor displays crisp, rich color, but the Diamond Stealth II G460 graphics card is outmoded. Audio is so-so—you probably won't be happy playing one of Mozart's concertos through the SoundBlaster SBS50 speakers—but it will suffice for the workplace.

There's no need for your IS department to padlock the Acma NPower 6350 PII-350's case—taking the top off requires that two people simultaneously push on two tabs in the lower corners of the case and pull at the chassis. But once inside the machine, you shouldn't have any trouble accessing the two free card slots or two free DIMM sockets. The NPower limits your peripherals, however, by including only one free drive bay. This means that, for example, you can't add both a hard drive and a tape backup unit.

Acma backs its systems with a fairly standard three-year parts, one-year labor warranty and unlimited toll-free technical support around the clock. The quality of support seems to be high; in answering our anonymous calls, the company's technicians provided us with quick, direct, and helpful answers to our intermediate and difficult questions. ▶

BEYOND THE TOP 20

online

We evaluated the following systems along with the others, but they didn't score high enough to reach the *Top 20 Budget Desktops* chart. For write-ups, go to PC World Online (www.pcworld.com/t20pcs).

- **Axis Systems Metropolis Gx3 PII-350**
- **Sys Technology Performance 333c**
- **Tagram TA 3500 AMD K6-2-333**

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PC WORLD

TOP 10 NOTEBOOK PCs

	POWER NOTEBOOK	Last month	Month tested	Street price (11/20/98)	CPU	Comments
1	Dell Latitude CPi D300XT 800/388-8542 www.dell.com	1	Nov 98	$3148	Pentium II-300	Thin laptop rides a $251 price drop to a fourth straight month as Best Buy.
2	Gateway Solo 2500LS 800/315-2536 www.gateway.com	2	Nov 98	$3074	Pentium II-300	Notebook with strong battery and fixed CD-ROM and floppy drives sheds $125.
3	WinBook XL2 800/965-9349 www.winbook.com	4	Jan 99	$3199	Pentium II-300	Presentation unit features huge screen, AGP bus, LS-120 disk drive.
4	Dell Inspiron 7000 D300GT 800/388-8542 www.dell.com	3	Nov 98	$3499	Pentium II-300	Stellar multimedia notebook now $50 less; weight restricts it to desktop use.
5	Toshiba Tecra 8000 800/867-4422 www.toshiba.com	5	Nov 98	$3499	Pentium II-266	Light magnesium interior frame makes portable a worthy road machine.
	BUDGET NOTEBOOK					
1	Unicent Voyager 1212 800/308-3614 www.unicent.com	n/a	NEW	$1899	Pentium II-266	Great deal on a speedy and light notebook that is ideal for travel.
2	Gateway Solo 2500SE 800/315-2536 www.gateway.com	1	Sept 98	$1999	Pentium II-233	Light laptop with built-in drives performs well on the road or on your desktop.
3	Gateway Solo 3100SE 800/315-2536 www.gateway.com	2	Jan 99	$2499	Pentium II-233	You pay a premium for this very light, thin notebook designed for travel.
4	Micron GoBook 2 266 888/634-8799 www.micronpc.com	3	Nov 98	$2498	Pentium II-266	Uniquely designed two-layer traveler has several battery and weight options.
5	AMS Tech Roadster 15CTA 800/258-2088 www.amstech.com	4	Jan 99	$1395	AMD K6-2-300	Low-cost notebook with bright screen and good performance now $100 less.

Best Buy See features chart, page 214.

n/a = not applicable [1]Includes computer; adapter; power cord; and floppy, DVD-ROM, or CD-ROM drive. [2]For more about products here, select the number on the product information card or visit www.pcworld.com/infonet. [3]Insufficient data to give a rating.

FOR THE FOURTH month in a row, Dell's Latitude CPi D300XT reigns atop the power notebook chart. It's not the first time a Dell system has enjoyed a long run as a Best Buy, even though the company's notebooks are no more cutting-edge than those from other vendors. High scores in reliability and service—two categories our readers value greatly—help keep Dell on top.

To be sure, we occasionally hear from a reader who's hopping mad about a Dell support fumble. But in our surveys, the latest of which polled more than 6800 *PC World* readers, Dell consistently ranks among the vendors with the largest percentage of satisfied customers. For the Latitude line, the company offers one of the best support packages, including a three-year warranty on parts. Notebooks in Dell's Inspiron line, which also appear regularly on our charts, are backed for three years on labor, too. Only Gateway comes close to matching Dell's record.

On the budget chart we have a new Best Buy, a lightweight Pentium II-266 from Unicent. The only one of nine new notebooks tested this month to earn a spot on our list, the $1899 Voyager 1212 is an outstanding performer for the price.

AGP GOES PORTABLE

A YEAR AFTER becoming standard equipment in Pentium II desktops, the Accelerated Graphics Port—a bus designed to improve computer graphics—is beginning to appear on some high-end notebooks. Does AGP make a difference? In our informal tests (for details about these, see PC World Online, www.pcworld.com/nov98/agpnotes), notebooks equipped with AGP rendered both 2D and AGP-optimized 3D graphics, such as bar and pie charts used in presentations, much more smoothly than laptops that transferred graphics data through the older PCI bus. Programs launched faster, and 3D graphics lost the jerky, pixelated appearance familiar to users of PCI-based notebooks. But the improvements aren't due to the bus alone: AGP-equipped notebooks usually come packed with lots of video RAM, faster processors, and bigger hard drives. Though many AGP portables are too expensive at the moment to gain widespread acceptance, they'll eventually become the standard. And so will good-looking 3D applications on the go.

But not all advances are as welcome. For example, we're sorry to say good-bye to energy-efficient Pentium MMX mobile chips; they'll be replaced very soon by a new generation of power-hungry Intel CPUs. Intel claims most notebook users are willing to sacrifice battery life for power. What do you think? Frustrated by the few hours you get off a battery charge? Ever get to a presentation and find yourself powerless? Send us your dead battery stories at vince_bielski@pcworld.com.

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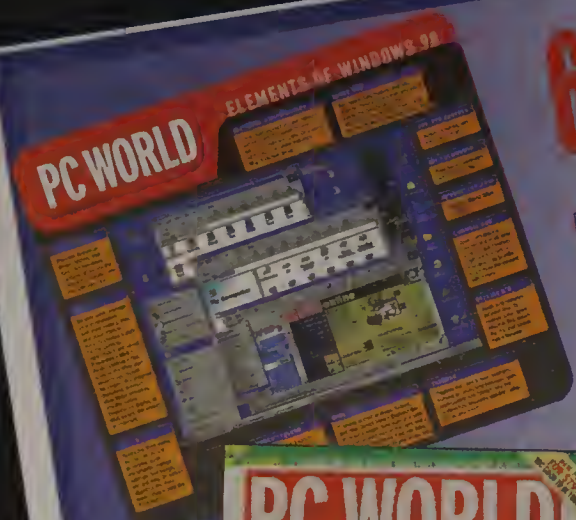

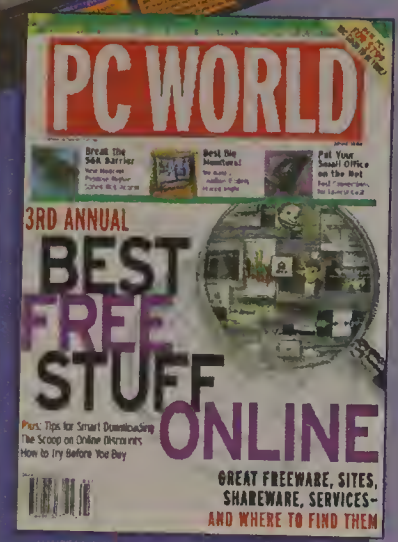

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★ Overall rating	PC WorldBench 98 score/performance	Price	Vendor's system reliability	Features and design	Vendor's support quality/policies	Battery life (hours:min)/rating	Traveling weight [1]	PC World InfoNet number [2]
90	159/outstanding	average	good	very good	good/good	3:05/good	average	610
87	158/outstanding	average	good	very good	good/fair	4:09/very good	heavy	611
87	164/outstanding	average	fair	very good	good/poor	2:22/satisfactory	heavy	612
86	162/outstanding	average	good	very good	good/fair	3:37/good	unacceptable	613
85	154/very good	average	good	very good	good/fair	2:42/satisfactory	light	614
Power scorecard weightings ▶	Performance 22 percent	Price 14 percent	Reliability 22 percent	Features 16 percent	Support 10 percent	Battery life 8 percent	Weight 8 percent	
86	149/outstanding	inexpensive	[3]	very good	adequate [4]/poor	3:22/good	light	615
85	125/good	average	good	good	good/fair	3:15/good	light	616
84	138/very good	expensive	good	very good	good/fair	2:47/satisfactory	very light	617
84	144/outstanding	expensive	fair	very good	good/fair	5:44/outstanding	heavy	618
84	122/good	very inexpensive	[3]	good	good [4]/fair	2:35/satisfactory	average	619
Budget scorecard weightings ▶	Performance 14 percent	Price 22 percent	Reliability 22 percent	Features 16 percent	Support 10 percent	Battery life 8 percent	Weight 8 percent	All products: 902

[4] Score was derived from anonymous support-quality calls due to insufficient data from survey.

This Month's Best Buys

POWER NOTEBOOKS

1 DELL LATITUDE CPI D300XT

PRO: Very fast; excellent keyboard

CON: Modem not included

Another price drop, this time to a reasonable $3148, seals this corporate-targeted notebook's place at the top of our power chart for another month. A pleasure to use, the Latitude CPi D300XT earned a PC WorldBench score of 159, placing it among the fastest notebooks we've ever tested.

As with its predecessor, the nearly identical Latitude CPi D266XT, the D300XT's pleasing charcoal-gray case measures 1.75 inches thick (a little thinner than the current notebook standard of 2 inches) and includes one modular bay on the side. Weighing in at 7.4 pounds and offering slightly more than 3 hours of battery life, the D300XT is more than adequate for work away from the office. You can increase its travel life by buying the optional $169 second battery and using two batteries at once.

Dell Latitude CPi D300XT

The Latitude CPi D300XT comes with a responsive, accurate touchpad and an excellent keyboard. Its adequate-size keys offer crisp action and occupy the expected positions, so adapting from a desktop keyboard to the D300XT's is a breeze. And you shouldn't have to worry about upgrading the unit's hard drive any time soon: At 6.4GB, it's one of the largest notebook hard drives currently available.

The CPi D300XT's brilliant screen produces a sharp image from edge to edge. We do have one gripe with the casing around the display, though: It's wider at the top of the screen, so when the lid is closed, it protrudes slightly over the edge of the notebook's case. As a result, if the portable should ever fall onto its side, the fragile screen would absorb much of the shock.

As with most notebooks, the D300XT's built-in stereo speakers yield tinny sound. But MIDI music sounds better thanks to a software wavetable synthesizer.

Though Dell generally earns high service and reliability marks from *PC World* readers, we've sometimes encountered long waits during our anonymous calls to its technical support line.

BUDGET NOTEBOOKS

1 UNICENT VOYAGER 1212

PRO: Fastest notebook under $2000 on chart, long-lasting battery, lightweight

CON: Basic design, generic documentation, short support hours, frail keyboard

Unicent, a direct marketer that made a name for itself with its supercheap desktop systems, now tops our budget notebooks chart with the phenomenally inexpensive Voyager 1212.

We've practically never seen a Pentium II-266 laptop with active-matrix screen and 4GB hard drive selling for less ▶

TOP 10 NOTEBOOK PCs — STANDARD FEATURES

	POWER NOTEBOOK	CPU	Traveling weight (pounds)[1]	RAM (MB)	Hard drive (GB)	Color screen type	Screen diagonal (inches)	Screen resolution	Maximum screen colors	Battery type	Pointing device
1	Dell Latitude CPi D300XT*	Pentium II-300	7.4	64	6.4	active	13.3	1024 x 768	262,144	lithium ion	touchpad
2	Gateway Solo 2500LS	Pentium II-300	8.3	64	4	active	13.3	1024 x 768	65,536	lithium ion	touchpad
3	WinBook XL2	Pentium II-300	8.0	128	6	active	14.1	1024 x 768	16.8 million	lithium ion	touchpad, eraserhead
4	Dell Inspiron 7000 D300GT	Pentium II-300	9.7	64	8	active	14.1	1024 x 768	16.8 million	lithium ion	touchpad
5	Toshiba Tecra 8000	Pentium II-266	7.2	64	6.1	active	13.3	1024 x 768	262,144	lithium ion	eraserhead
	BUDGET NOTEBOOK										
1	Unicent Voyager 1212*	Pentium II-266	7.3	64	4	active	12.1	800 x 600	16.8 million	lithium ion	touchpad
2	Gateway Solo 2500SE	Pentium II-233	7.1	32	2.1	active	12.1	800 x 600	262,144	lithium ion	touchpad
3	Gateway Solo 3100SE	Pentium II-233	6.1	64	4	active	12.1	800 x 600	16.8 million	lithium ion	eraserhead
4	Micron GoBook 2 266	Pentium II-266	8.3	64	3	active	12.1	800 x 600	16.8 million	lithium ion	touchpad
5	AMS Tech Roadster 15CTA	AMD K6-2-300	7.9	32	2.1	active	12.1	800 x 600	16.8 million	NiMH	touchpad

*Best Buy ● Yes ○ No [1]Includes computer; adapter; power cord; and floppy, DVD-ROM, or CD-ROM drive. [2]One year on battery.

than two grand. So the $1899 Voyager is a nice choice for individuals or small businesses on a budget, especially when you consider its long battery life. Just don't expect top-drawer components.

The modestly equipped Voyager's plain, boxy, silver-colored case won't turn many heads. And its convenient but limiting configuration—which includes built-in floppy and CD-ROM drives—prevents you from swapping in a DVD-ROM drive or adding a second battery. On the other hand, the Voyager features an easy-to-remove hard drive: Just press a lever and pull the drive out of the right side of the case. The battery also lifts out easily.

Some of the Voyager's other features clearly indicate that the notebook was designed for travel. The battery lasts 3 hours and 22 minutes, at least 20 minutes longer than most Pentium II-266 notebooks with 12.1-inch screens we've tested. With a case measuring 1.75 inches and a traveling weight of 7.3 pounds, the Voyager is a hair thinner and a feather lighter than a standard notebook. A built-in modem means you don't have to bother with a fragile PC Card connector.

Durability, though, doesn't seem to be one of the Voyager's strengths. The laptop's touchpad and keyboard are comfortable, but the keys felt so loose and springy we half expected one to pop off. Using the external volume control buttons also gave us pause; we had to press so hard on the strangely designed and fragile-looking buttons located at the top of the keyboard that we feared they'd break.

Like most small vendors, Unicent provides a support package that looks skimpy next to a Dell or Gateway plan. The Voyager's manual, presented successively in four languages, covers little beyond the basics. The company limits technical support hours to 12 hours on weekdays and 7 hours on Saturday. If you don't need wall-to-wall coverage, though, the Voyager offers first-rate speed at a bargain-basement price.

Unicent Voyager 1212

Near Misses

Eight of the notebooks we tested this month failed to make our charts. Three are highlighted below; the other five are listed in the "Beyond the Top 10" box on page 215.

THIS MONTH'S chart missers ranged from a jumbo corporate model from Compaq to a new version of a thin IBM ThinkPad. Of these, a Pentium MMX-233 from Progen came closest to earning a spot, narrowly missing our budget chart.

Progen's $1499 Venture M233 reminds us of a pair of sensible shoes: not flashy, but affordable and comfortable. The boxy, black, 8.3-pound notebook comes with just about everything built in—a floppy drive, a CD-ROM drive, and a 56-kbps modem. The entire notebook, including the firm keyboard and the smooth touchpad, feels well built. At this price, you don't get a big hard drive (just 2GB), but you do get a spacious 13.3-inch active-matrix screen. The Venture M233 has a middle-of-the-road battery life of about 3 hours and a modest PC WorldBench 98 score of 112, which is nevertheless higher than most similarly configured notebooks.

The notebook's audio features, documentation, and support plan are nothing to write home about—phone calls aren't answered on weekends—but they'll do in a notebook this cheap. If nothing on our budget chart grabs your attention, take a close look at this inexpensive option.

FLEXIBLE FUJITSU

NO OTHER NOTEBOOK—not even one from NEC's trailblazing Versa line—offers as many mix-and-match drive and

		EXPANDABILITY					CUSTOMER SUPPORT			
CD/DVD-ROM drive speed	56-kbps modem protocol	Maximum RAM (MB)	Modular expansion bays	Bay for second battery	Optional docking station	Infrared port	Warranty for parts/labor (years)	Weekday toll-free support (hours)	Weekend support	Online support
12X-24X	not included	128	1	●	●	●	3/1	24	Sat., Sun.	BBS, WWW
8X-20X	V.90	128	0	○	●	●	1/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
2X DVD	V.90	128	0	○	○	●	1/1	13	Sat.	BBS, WWW
2X DVD	K56flex	192	1	●	○	●	3/3	24	Sat., Sun.	BBS, WWW
12X-24X	V.90	256	1	○	●	●	3 [2]/3	24	Sat., Sun.	BBS, CIS, WWW
12X-24X	K56flex	128	0	○	○	●	1/1	12	Sat.	BBS, WWW
8X-20X	not included	160	0	○	●	●	1/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
8X-20X	K56flex	96	0	○	○	●	1/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
10X-24X	x2	96	1	●	●	●	varies [3]/1	24	Sat., Sun.	BBS, CIS, WWW
10X-24X	K56flex	96	0	○	○	●	3/3	11	none	BBS, CIS, WWW

[3] Five years on CPU and main RAM, one year on other parts.

battery options as Fujitsu's LifeBook E350. If you can afford these extras, you can configure this attractive 8.2-pound desktop replacement in dozens of ways, depending on your computing needs. Unfortunately, Fujitsu's spotty record on support and notebook reliability prevents us from recommending its portables for now.

We're also not crazy about the LifeBook's ErgoTrac—a big round button that takes the place of a touchpad—because we suspect that some users will find it hard to master. And the E350's mouse buttons are hard plastic slivers that our thumbs missed nearly every time.

On the positive side, we found the E350 easy to type on, once we got used to the slightly rounded wrist rest (which at first gave our hands the sensation of being pushed away). The LifeBook's brightness slider, one of its better features, beats the pants off standard hot-key combinations for screen adjustments. We also loved its LED status indicator. Located at the top of the keyboard, it reports on notebook activities with easy-to-see flashing letters.

The LifeBook accommodates a wide range of devices thanks to the two multipurpose bays on its front. The left bay accepts the floppy drive; the right bay takes a DVD-ROM drive, LS-120 drive, Zip drive, or second hard drive (all sold at extra cost). Either bay will hold the CD-ROM drive or a battery, an unusually flexible arrangement. According to Fujitsu, all the options can be hot-swapped and shared across the E series of notebooks.

We haven't tested any similarly configured notebooks, but the E350's PC WorldBench 98 score of 146 is about what we'd expect from a PII-300 equipped with Windows 95 and only 32MB of RAM.

A useful "Getting Started" foldout guide labels parts of the notebook, lists the utilities, and provides tips on how to optimize battery life. The thorough user guide includes a glossary, a big troubleshooting section, and lots of helpful illustrations.

HORSEPOWER IN HAND

YEEE-HAW! AMS Tech's Rodéo 1010CT is a frisky little filly whose long-lived battery will let you ride the range half the day before heading back to the ranch. She's a mite homely, with a gray, boxy finish, and she's not built to take lots of extra accessories. You'll have to scrape by with less documentation and shorter support hours than those big-city companies offer, too—that's why the Rodéo doesn't make our chart. But those are the only burrs under our saddle. For a Pentium II-300 with a DVD-ROM drive and an active-matrix screen, $2495 is pretty durn good. The Rodéo's basic design includes fixed DVD-ROM and floppy drives, so you can't swap in other options. The Rodéo's touchpad and keyboard worked just fine, but we noticed that the keys have a loose, springy sound and feel to them, giving us a slight case of the yips about its durability. Screen resolution is limited to 800 by 600, but that's not a problem unless you have a hankerin' for every last millimeter of desktop or spreadsheet.

The Rodéo's stereo speakers, which are located near the notebook's hinges, deliver that sheriff's star sound—slightly tinny. We cottoned to AMS Tech's unique solution for adjusting audio, though. Instead of a dial, three function keys—for turning the sound up, down, and off—make controlling volume from the keyboard as easy as falling off a horse. ■

BEYOND THE TOP 10

Other models evaluated this month (listed below) failed to score high enough to make the *Top 10 Notebook PCs* chart. For reviews, visit PC World Online (www.pcworld.com/top400).

- **Compaq Prosignia 160**
- **Gateway Solo 5150LS**
- **IBM ThinkPad 560Z**
- **Progen Venture PII-300**
- **Toshiba Satellite 4015CDS**

PC WORLD

TOP 10 HOME PCs

	POWER SYSTEM	Last month	Month tested	Street price (11/20/98)	Comments
1	Dell Dimension XPS R450 800/388-8542 www.dell.com	1	Dec 98	$2559	PRO: Fine performance for the second-cheapest power PC, great for demanding applications. CON: Limited software package.
2	Micron Millennia 450 Max 888/634-8799 www.micronpc.com	2	Dec 98	$2899	PRO: Fastest home PC to date, hardware extras including joystick and gamepad. CON: Very pricey.
3	Compaq Presario 5600 800/888-0220 www.compaq.com	4	Dec 98	$2599	PRO: Great speed, built-in ethernet, DSL capability, FireWire. CON: So-so reliability and support ratings.
4	Gateway G6-450 800/315-2536 www.gateway.com	n/a	NEW	$2489	PRO: Fast, super graphics performance, terrific sound system, great selection of software. CON: Mediocre reliability rating.
5	Sony VAIO PCV-E308DS 800/315-7669 www.sony.com/pc	5	Jan 99	$2899	PRO: Supereasy set up, lots of digital imaging software, FireWire. CON: Tied for most expensive PC on chart, poor upgradability.
	BUDGET SYSTEM				
1	Quantex QP6/333 M-1c 800/896-4898 www.quantex.com	n/a	NEW	$1099	PRO: Fast, super price even for a Celeron system. CON: Standard keyboard not very solid, limited software package.
2	Dell Dimension V333c 800/388-8542 www.dell.com	1	Dec 98	$1499	PRO: Very fast and easy to use, first-class reliability rating. CON: Expensive for a budget system, limited range of bundled software titles.
3	Gateway G6-333c 800/315-2536 www.gateway.com	4	Jan 99	$1512	PRO: Fast for a Celeron PC, bundled with Canon BJC-4300 color bubble-jet printer. CON: So-so performance with games, mediocre reliability rating.
4	Compaq Presario 2266 800/888-0220 www.compaq.com	5	Jan 99	$948	PRO: Very cheap, decent speed for the price. CON: Sluggish graphics performance, skimpy software bundle.
5	Micron Millennia 350 888/634-8799 www.micronpc.com	3	Dec 98	$1499	PRO: Fastest budget machine we've tested to date. CON: Fairly high price tag, modest software package.

Best Buy n/a = not applicable [1] For more about products here, select the number on the product information card or visit www.pcworld.com/infonet.

WHEW! The holiday madness is finally over. We're left with pounds of poultry, dollars of debt, and (for those of us still shopping) more home PC choices than ever. In the past three months we tested 33 home systems ranging from fast, expensive muscle machines to no-frills budget systems. What did we learn from the latest holiday rush? That there's a home PC to match every need.

The PCs we tested this month illustrate our point. Of six new systems, two made the Top 10. Gateway's speedy Pentium II-450 is designed to satisfy the power hungry, while consumers on a budget will welcome an affordable Celeron-333–based system from Quantex that perfectly balances performance and price.

POWER-PACKED PCS

GATEWAY'S NEW G6-450, number four on the power list, is a slightly reconfigured version of the G6-450 that we first tested in December. Costing $254 less than last month, this $2489 PC lacks the Philips CDD3610 CD-R/RW drive found on the earlier model—though that drive remains available as a $225 option—and comes with less expensive (but still crisp-sounding) Boston Acoustic BA635 speakers. On the other hand, Gateway beefed up other components. The company increased the size of the hard drive from 10GB to 14GB and upgraded the graphics card from an STB Velocity 128 ZX to an STB Velocity 4400, which packs 16MB of RAM. That advance, together with an updated Toshiba DVD-ROM drive, helped the G6-450 post the highest graphics scores we've seen yet.

The new Gateway machine has plenty of room for expansion, with three free PCI slots (plus one shared) and three open external drive bays. It comes with a bonanza of software as well as Gateway's own HelpSpot, an easy-to-use program for diagnosing PC problems.

Gateway G6-450

The system's top-notch performance and features were slightly offset by Gateway's middling reliability scores, which prevent the PC from earning Best Buy honors on the power chart.

Two powerful, well-built home PCs won those honors this month—Dell's Dimension XPS R450 and Micron's Millennia 450. Their close overall scores are due, in part, to some new tests that help determine a PC's graphics capability. For instance, tests of DVD-ROM drives to gauge a PC's audio and video playback quality now factor into the overall Graphics score.

Though the Dell and the Micron raced to a photo finish, there are differences between the two. The Dimension XPS R450 is slightly less expensive, but it has fewer features. The Millennia 450 Max, on the other hand, is a gamer's dream machine that comes equipped with loads of goodies like a joystick, a game pad, and lots of cool games. For more details about both the Dell

SCORECARD

★ Overall rating	PC WorldBench 98 score/rating	Price	Setup/ ease of use	Graphics	Reliability/ support	Features	PC World InfoNet number[1]
85	218/outstanding	expensive	good/ outstanding	outstanding	outstanding/ fair	Pentium II-450, 128MB of SDRAM, 10GB hard drive, 2X DVD-RDM drive, V.90 56-kbps modem, 17-inch monitor, Turtle Beach Montego sound card.	658
85	221/outstanding	very expensive	very good/ good	outstanding	good/ good	Pentium II-450, 128MB of SDRAM, 14.4GB hard drive, 2X DVD-RDM drive, x2 56-kbps modem, 19-inch monitor, Iomega Zip drive, Sidewinder joystick.	659
82	216/outstanding	expensive	outstanding/ good	good	fair/ fair	Pentium II-450, 128MB of SDRAM, 12.9GB hard drive, 2X DVD-ROM drive, V.90 56-kbps modem, 19-inch monitor, built-in ethernet.	660
81	212/outstanding	expensive	outstanding/ outstanding	outstanding	fair/ good	Pentium II-450, 64MB of RAM, 14GB hard drive, 2X DVD-ROM drive, V.90 56-kbps modem, 19-inch monitor, Boston Acoustics BA635 speakers.	661
81	201/good	very expensive	outstanding/ good	outstanding	good/ good	Pentium II-450, 128MB of SDRAM, 10GB hard disk, 2X DVD-RDM drive, V.90 56-kbps modem, 17-inch monitor.	662
Power scorecard weightings ▶	Performance 20 percent	Price 10 percent	Setup/ease 15 percent	Graphics 15 percent	R & S 25 percent	Features 15 percent	
77	169/outstanding	inexpensive	good/ good	good	good/ good	Celeron-333, 64MB of SDRAM, 4GB hard disk, 12X-24X CD-ROM drive, K56flex 56-kbps modem, 15-inch monitor.	663
73	169/outstanding	expensive	fair/ outstanding	good	outstanding/ fair	Celeron-333, 64MB of SDRAM, 8.4GB hard disk, 32X-40X CD-ROM drive, x2 56-kbps modem, 17-inch monitor, Harman/Kardon HK195 speakers.	664
73	174/outstanding	expensive	outstanding/ good	fair	fair/ good	Celeron-333, 64MB of SDRAM, 6.4GB hard drive, 2X DVD-RDM drive, V.90 56-kbps modem, 17-inch monitor, Canon BJC-4300 printer.	665
73	130/good	very inexpensive	good/ fair	poor	fair/ fair	IBM 6x86MX-PR300, 64MB of SDRAM, 3GB hard drive, 12X-32X CD-ROM drive, V.90 56-kbps modem, 15-inch monitor.	666
72	178/outstanding	expensive	very good/ good	good	good/ good	Pentium II-350, 64MB of SDRAM, 10GB hard drive, 24X-32X CD-ROM drive, x2 56-kbps modem, 17-inch monitor.	667
Budget scorecard weightings ▶	Performance 15 percent	Price 20 percent	Setup/ease 15 percent	Graphics 5 percent	R & S 40 percent	Features 5 percent	All products: 906

and the Micron, see our December 1998 roundup "Home PCs for the Holidays" (www.pcworld.com/dec98/homepcs).

LOW-COST WINNER

DEBUTING AT number one on the budget chart, Quantex's brand-new QP6/333 M-1c pushes last month's Best Buy, Dell's Dimension V333c, down a notch to second place.

At $1099, the QP6/333 M-1c is not quite a sub-$1000 system, but it is the first Celeron-333–based system on our chart to come close. It's a great choice for anyone who needs real speed and expandability at a good price, plus the backing of a company with good reliability and service ratings.

QP6/333 M-1c

The 15-inch CTX VL500 monitor included at this price, however, is a little disappointing: Its text display is crisp, but colors in graphics look washed out. In addition, the keys on the keyboard feel somewhat loose and insubstantial (read: cheap). The limited software bundle does include Corel's WordPerfect Suite 8, Internet the City, and Amazon Trail II.

OFF THE CHART

THIS MONTH we also tested one of IBM's latest offerings, the Aptiva E4N. Its high price, slightly disappointing performance, and mediocre service rating kept it from making the budget chart. The E4N, powered by AMD's K6-2-350 processor, posted a PC WorldBench 98 score of 165—closer to Pentium II-333 performance. For $1498, the E4N carries only a 15-inch monitor, one free expansion slot, and one free drive bay. You don't get much software, either—just Lotus SmartSuite 97 and a CD with IBM's proprietary system apps. But while demanding buyers may want to pass, buyers seeking a hassle-free system will like the clear documentation and well-marked cables, which help ease setup.

Another newcomer that didn't make the budget chart is Packard Bell's Platinum 7800. At $1278, it's priced very aggressively for a Pentium II-350 system with a 17-inch monitor. Setup is a snap, thanks to clearly written documentation and the monitor's built-in speakers; and an abundance of easily accessible expansion slots and drive bays should make the task of adding new components every bit as easy. Like all Packard Bell systems, this one comes with loads of troubleshooting and maintenance utilities, such as CyberWarner, CyberCoach, and CyberTrio.

So why didn't the 7800 make the chart? Poor service ratings and performance that's well below average for a Pentium II-350 system hold it back.

Kirk Steers is a contributing editor for PC World. *Testing was performed by Ulrike Diehlmann of the PC World Test Center.* ■

BEYOND THE TOP 10

online

We evaluated the following systems this month, too, but they didn't score high enough to make the *Top 10 Home PCs* chart list. For write-ups, see PC World Online (www.pcworld.com/t10homepcs).

- **IBM Aptiva E4N**
- **Packard Bell Platinum 7800**
- **NEC Ready 9910**
- **NexTrend NexStar 450 PWH**

PC WORLD

TOP 10 PRINTERS

	SMALL-BUSINESS/HOME COLOR	Street price (11/4/98)	Overall rating	Speed for plain text/full-page graphics (ppm)	Print quality for text/color graphics	Comments	PC World InfoNet number
1	Canon BJC-5000 800/652-2666 www.ccsi.canon.com	$229	83	2.3/0.4	good/ adequate	**FEATURES:** Ink jet, rated 7.5 ppm monochrome/3 ppm color. 1440-by-720-dpi maximum resolution, 130 sheets input and output. **SUMMARY:** $20 price drop, good text quality, and top-notch paper-handling options (it accepts sheets up to 11 by 17 inches, for example) offset below-average speeds.	688
2	Epson Stylus Photo 700 800/463-7766 www.epson.com	$249	83	1.3/0.4	adequate/ good	**FEATURES:** Ink jet, speed unrated. 1440-by-720-dpi maximum resolution, 100 sheets input, 30 output. **SUMMARY:** $30 price drop; good graphics print quality on plain paper—and outstanding quality on specialty media—but text speed is particularly slow. Comes with a strong photo-oriented software bundle.	–
3	Canon BJC-4400 800/652-2666 www.ccsi.canon.com	$149	82	2.1/0.4	adequate/ adequate	**FEATURES:** Ink jet, rated 6.5 ppm monochrome/2.5 ppm color. 720-by-360-dpi maximum resolution, 100 sheets input and output. **SUMMARY:** An even better buy with $30 price drop. Good paper-handling capabilities help compensate for slow page generation and middling print quality.	689
4	Epson Stylus Color 1520 800/463-7766 www.epson.com	$499	81	3.3/1.2	good/ good	**FEATURES:** Ink jet, rated 6 ppm monochrome/5 ppm color. 1440-by-720-dpi maximum resolution, 100 sheets input, 35 output. **SUMMARY:** Whopping $300 price drop, and it prints big—on sheets up to 13 by 19 inches. Print quality at default settings is fine; but at special settings on ink jet stock, output looks truly outstanding.	–
5	Lexmark 3200 Color Jetprinter 800/539-6275 www.lexmark.com	$179	81	2.1/0.4	good/ good	**FEATURES:** FEATURES: Ink jet, rated 6 ppm monochrome/2.5 ppm color. 1200-by-1200-dpi maximum resolution, 100 sheets input, 25 output. **SUMMARY:** Solid print quality for a reasonable price, but performance is somewhat slow and the design could be sturdier. The number seven 5700 Color Jetprinter offers more features.	690
6	HP DeskJet 895Cse 800/552-8500 www.hp.com	$399	81	4.6/0.9	good/ good	**FEATURES:** Ink jet, rated 10 ppm monochrome/6 ppm color. Maximum resolution unrated, 100 sheets input, 50 output. **SUMMARY:** Though it costs more than we'd like, a robust design, strong paper-handling capabilities, and good print quality land it on the Top 10 for the first time. Fastest text printing on the chart and second-fastest graphics printing also help.	691
7	Lexmark 5700 Color Jetprinter 800/539-6275 www.lexmark.com	$249	81	2.9/0.3	good/ good	**FEATURES:** Ink jet, rated 8 ppm monochrome/4 ppm color. 1200-by-1200-dpi maximum resolution, 100 sheets input, 25 output. **SUMMARY:** Slightly faster on text than the Canon BJC-5000, but with less impressive print quality. Home users will especially like the bundled CD-ROM of related software.	692
	CORPORATE COLOR						
1	Lexmark Optra SC 1275 800/539-6275 www.lexmark.com	$2149	94	7.5/0.5	good/ good	**FEATURES:** Laser, rated 12 ppm monochrome/3 ppm color. Standard 16MB of RAM, 600-by-600-dpi maximum resolution, 400 sheets input, 250 output. **SUMMARY:** A great choice for busy offices gets better with an $850 price drop. High printing speeds, extensive paper-handling options, and an easy-to-use design help, too.	693
2	Tally T8104 (NEW) 800/843-1347 www.tally.com	$2429	90	9.8/0.5	good/ good	**FEATURES:** Laser, rated 16 ppm monochrome/8 ppm color. Standard 24MB of RAM, 1200-by-600-dpi maximum resolution, 250 sheets input and output. **SUMMARY:** Fastest text speed on corporate chart, low price, and good print quality make this new model a contender, bumping the QMS Magicolor 2 CX despite the latter's superior color quality.	694
3	Minolta Color PageWorks PS 888/264-6658 www.minoltaprinters.com	$3299	86	6/0.4	good/ good	**FEATURES:** Laser, rated 12 ppm monochrome/3 ppm color. Standard 20MB of RAM, 600-by-600-dpi maximum resolution, 400 sheets input, 250 output. **SUMMARY:** Impressive text quality and good paper-handling features help make up for somewhat slow speed, particularly on text. Gray-scale graphics are a bit coarse.	695

Best Buy Recommended for home Windows 95-certified Plug and Play All products: 908

TEST PC WORLD CENTER

HOW WE TEST The overall rating for both small business/home and corporate color printers is based on print quality (25 percent), price (25 percent), features (15 percent), speed (10 percent), service and support (10 percent), and ease of use (15 percent). For all ratings, higher is better. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

COLOR PRINTER PRICES are dropping like stalks of sugar cane before a machete, which means you can find great bargains for your office or home (or plantation), such as our Best Buy Canon BJC-5000. Despite the reshuffling atop our Top 10 chart, however, price reductions on older printers prevented five pricey new models we tested this month from making the list; only one newcomer, the Tally T8104, earns a spot.

SLASH AND BURN

DO YOU LUST after a color laser printer? You just got lucky. Prices of color laser have gone from about $8000 to $3500 in the past two years. Lexmark, for example, now sells its Optra SC 1275 for $2149. Our favorite color laser back in November—when it cost $2999—the SC 1275 still impresses us with its speed and versatility.

Ink jets are getting cheaper by the minute, too. Canon knocked $20 off its wide-format BJC-5000, which assumes top spot on our small-business/home chart. The $229 BJC-5000 costs less than any other ink jet we've seen that prints large-format pages (a maximum of 11 by 17 inches), and it can run two black or two color cartridges simultaneously, speeding up intensive print jobs. We also like the BJC-5000's text print quality, features, and paper handling.

Canon lopped $30 off the price of another ink jet, the BJC-4400, which now costs $149 and has jumped from seventh place to third. A home office bargain, the BJC-4400 handles a wide range of papers, though its print quality could be better.

Epson announced an even steeper price reduction—from $799 to $499—on its wide-format Stylus Color 1520. Outmaneuvering several new models with similar network connectivity, paper handling, and performance but with price tags around $800, the 1520 rises to fourth place. (For details on these older printers, see "All Color, All the Time," December 1998, www.pcworld.com/dec98/printers.)

Meanwhile, most of the new color printers we looked at this month could use price cuts. We tested three: NEC's SuperScript 4400, Tally's T8104 (built on the same engine), and Lexmark's Optra Color 1200. We also examined three new ink jets: Epson's Stylus Color 740, Lexmark's Optra Color 45, and Xerox's DocuPrint C20. The latter two use the same software.

NEW AND NOTEWORTHY

IF YOU NEED to print 11-by-17-inch pages and want office-level speed, paper capacity, and networkability, the expensive ($5999) Optra Color 1200 may fill the bill you foot. The 1200 produces sharp text, but it distorted some colors on our tests. It's much faster than the new tabloid-format ink jets, churning out almost 9 text pages per minute compared to the Xerox C20's and Lexmark 45's 2.7 ppm, for example. The 1200 also supports two extra 250-sheet paper trays and an optional hard disk; you can even receive (but not send) faxes by adding a tri-port device. But move the furniture: With all its paper trays extended, this model measures about 4 feet by 2 feet.

NEC's $3499 SuperScript 4400 fell just shy of the chart despite strong text quality and good speeds. Colors were a bit green, but still remarkably appealing. The Tally T8104 was the only new printer to make the chart, debuting at number two among corporate color models. It produces clean text and realistic grays and colors, though all prints look a little light. We liked the Tally's print speeds and its low price of $2429—including ethernet connectivity.

THE PRICEY $399 HP DeskJet 895Cse climbs onto the chart with a robust design, fine paper handling, and good print quality.

Even as color laser prices lurch toward affordability, new networkable, high-speed ink jets shoot for small businesses. This month we tested two office-minded ink jets, Lexmark's $899 Optra Color 45 and Xerox's $799 DocuPrint C20. Both tabloid-format models are costly, and we weren't impressed with their speeds (both printed text at 2.7 ppm and graphics at 0.3 ppm). The two produced readable text and good, albeit somewhat gritty, gray-scale and color graphics. But the software they share needs work: users face nightmarish installation and a confusing driver.

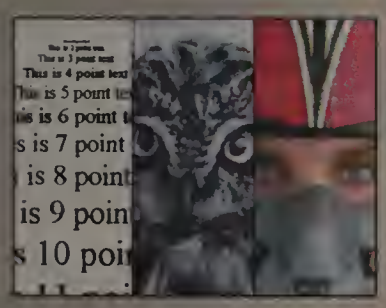
This month's only new ink jet geared toward home users—Epson's Stylus Color 740 was admirably swift for a $279 unit: 3.3 ppm on text and 1.1 ppm on graphics. A USB port comes standard, and the software bundle includes Adobe PhotoDeluxe and Broderbund's PrintShop PressWriter. But the 740 generated merely adequate text, spotty grays, and middling color.

Absent from our charts after a long run is Hewlett-Packard's DeskJet 722C, an enduring favorite and our December Best Buy for small businesses. We'll test its successor, the DeskJet 882C, as soon as we can get our hands on one.

—*Dan Littman* ■

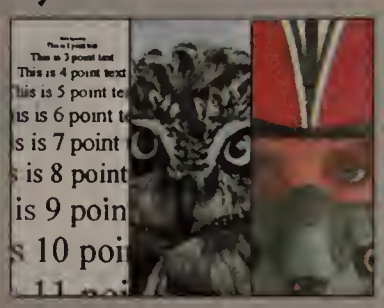
PRINT QUALITY SAMPLES

Realistic Grays and Color With Canon



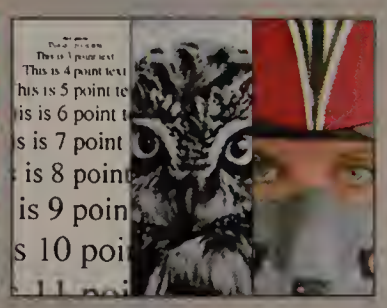
CANON BJC-5000

Our new Best Buy, the BJC-5000 shines with dark, even text and realistic gray-scale images. Colors are detailed, though a bit flat, and they stand out on ink jet paper.



HP DESKJET 895CSE

New to our chart, the sixth-place 895Cse prints rich black text; bright, if grainy color; and smooth, detailed grays. Print quality on ink jet stock is excellent.



TALLY T8104

The only new model to make our chart this month, the Tally produces crisp text, though it's a little wispy on small type. Grays and colors are light but detailed.

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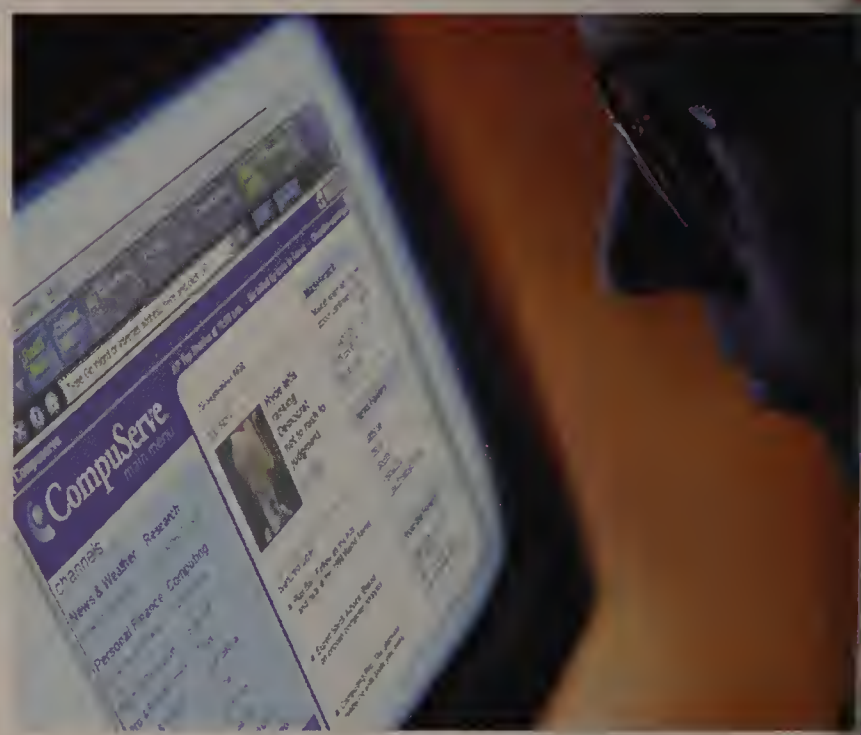

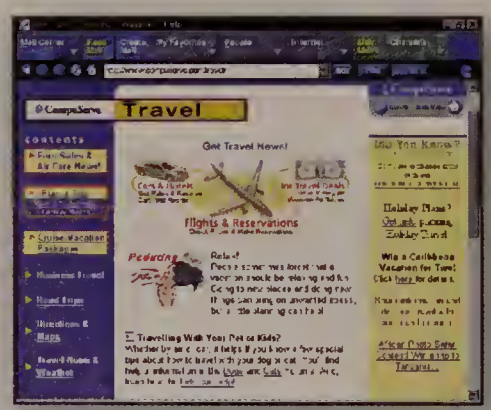

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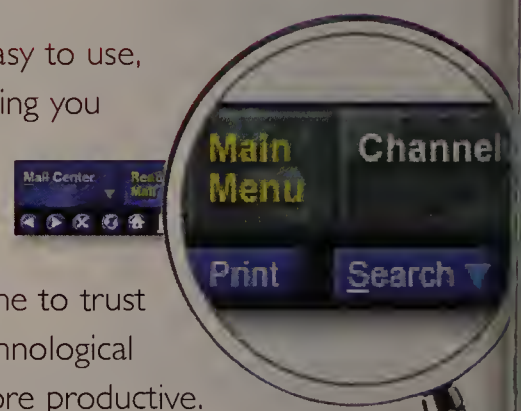

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PC WORLD

TOP 10 MONITORS

	19-INCH MONITOR	Month tested	Street price (11/09/98)	Overall rating	Quality of text/graphics	Comments	PC World InfoNet number
1	Dell UltraScan P990 800/289-3355 www.dell.com	NEW	$549	86	very good/ very good	**FEATURES:** 17.8-inch viewable area, .26mm stripe pitch Trinitron tube, up to 90-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, one-year warranty, 24-hour toll-free support. **SUMMARY:** Low price, crisp text, and vivid colors eclipse short warranty, which extends to three years if monitor is purchased with a Dell system.	601
2	Iiyama VisionMaster 450 800/394-4335 www.iiyama.com	Apr 98	$599	85	excellent/ very good	**FEATURES:** 17.6-inch viewable area, .26mm dot pitch tube, up to 94-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 12-hour weekday toll-free support. **SUMMARY:** Bright graphics, razor-sharp text, and $200 price cut keep it near the top, but on-screen controls lack numeric gauges for adjustment.	602
3	Sony Multiscan CDP-420GS 800/476-6972 www.sonypc.com/newdisplays	NEW	$699	81	very good/ very good	**FEATURES:** 18-inch viewable area, .25mm stripe pitch Trinitron tube, up to 85-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 24-hour weekday toll-free support. **SUMMARY:** Expensive monitor has a finely balanced picture and an extensive array of intuitive, well-organized on-screen controls.	603
4	Princeton AGX 900 800/747-6249 www.prgr.com	NEW	$599	80	very good/ very good	**FEATURES:** 17.7-inch viewable area, .25mm stripe pitch Trinitron tube, up to 88-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 24-hour toll-free support. **SUMMARY:** Low price, graceful design, wide array of controls; but image quality lags a bit, and submenus for controls can be hard to navigate.	604
5	ViewSonic MB90 800/888-8583 www.viewsonic.com	NEW	$699	80	very good/ very good	**FEATURES:** 18-inch viewable area, .26mm stripe pitch Sonictron tube, up to 88-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 11-hour weekday toll-free support. **SUMMARY:** Lively colors, built-in speakers and subwoofer, and USB ports override high price and relatively short tech support hours.	605
	21-INCH MONITOR						
1	Cornerstone Imaging P1500 800/562-2552 www.bigmonitors.com	NEW	$1245	85	very good/ excellent	**FEATURES:** 19.8-inch viewable area, .27mm dot pitch tube, up to 97-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, five-year warranty, 11.5-hour weekday toll-free support. **SUMMARY:** Excellent graphics score; crisp, dark text; and long warranty are strong points. We'd have liked longer tech support hours, though.	606
2	Iiyama VisionMaster Pro 502 800/394-4335 www.iiyama.com	NEW	$999	84	very good/ very good	**FEATURES:** 19.4-inch viewable area, .28mm stripe pitch Diamondtron tube, up to 102-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 12-hour weekday toll free support. **SUMMARY:** Inexpensive model features high refresh rate and color correction utilities, but control buttons aren't sensitive.	607
3	Sony Multiscan CDP-520GS 800/352-7669 www.sonypc.com/newdisplays	NEW	$1200	84	very good/ excellent	**FEATURES:** 19.9-inch viewable area, .25mm stripe pitch Trinitron tube, up to 85-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 24-hour toll-free support. **SUMMARY:** Short depth, large viewable area, and colors that nearly equal those on the Cornerstone; no controls for focus and convergence.	608
4	Princeton Caliente C2001 800/747-6249 www.prgr.com	Apr 98	$999	83	very good/ very good/	**FEATURES:** 19.4-inch viewable area, .28mm stripe pitch Diamondtron tube, up to 100-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 24-hour toll-free support. **SUMMARY:** $500 price drop. Small viewable area; displays graphics a tad better than text; on-screen control buttons seem flimsy.	609
5	IBM P202 800/843-2515 www.pc.ibm.com/us/accessories/monitors	NEW	$1299	82	very good/ excellent	**FEATURES:** 19.8-inch viewable area, .25mm stripe pitch Trinitron tube, up to 85-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 24-hour toll-free support: **SUMMARY:** Strong colors and sharp text can't compensate for high price. Controls were hard to navigate and required extra button pressing.	–

Best Buy For reviews of products that didn't make the chart, visit www.pcworld.com/t10monitors. All products: 901

TEST PC WORLD CENTER **HOW WE TEST** Ten judges rate a monitor's text and graphics quality. We evaluate each unit on how well it displays typical business letters, a newsletter, spreadsheets, Web pages, and scanned images. The overall rating is based on text and graphics quality (25 percent each), features and ease of use (25 percent), price (20 percent), and service and support (5 percent). The best possible overall rating is 100. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

[1] Highest refresh rate at 1280 by 1024 resolution. [2] Plug and Play monitors and graphics cards can communicate bidirectionally. However, Windows 95 does not fully utilize monitor Plug and Play.

NEW 19-INCH MONITORS are more affordable than ever. A few models feature the newest advance, reduced depth, which saves desktop space, as well as USB ports, fast becoming a new standard. Among 19-inch models, Dell's new UltraScan P990 leads the way, combining terrific image quality, price, and ease of use. On the 21-inch front, meanwhile, Cornerstone Imaging's P1500 earns a Best Buy with a five-year warranty and great picture quality. ■

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PC WORLD

TOP 10 GRAPHICS BOARDS

	PCI BOARD	Month tested	Street price (12/4/98)	Overall rating	Mixed-media business rating	3D rating	Features rating	Comments	PC World InfoNet number
1	STB Velocity 4400 PCI 800/234-4334 www.stb.com	NEW	$149	89	good	average	excellent	**FEATURES:** 16MB of SDRAM, 250-MHz RAMDAC, NVidia RIVA TNT chip, bundled graphics plug-ins, video editing tool, and 3D game. **SUMMARY:** STB board boasts excellent features, pleasing performance, and top-notch support policies.	648
2	Matrox Millennium G200 SD PCI 800/844-8305 www.matrox.com/mga	NEW	$129	87	good	excellent	good	**FEATURES:** 8MB of SGRAM, 250-MHz RAMDAC, MGA-G200 chip, bundled 3D modeling and image editing tools and 3D game. **SUMMARY:** Affordable board performs well in graphics-heavy apps—a good upgrade for most business users and casual gamers.	649
3	Diamond Monster Fusion PCI 800/468-5846 www.diamondmm.com	Jan 99	$150	86	good	excellent	average	**FEATURES:** 16MB of SDRAM, 250-MHz RAMDAC, 3Dfx Voodoo Banshee chip, bundled 3D games. **SUMMARY:** Splendid all-around performance, especially in 3D; a fine choice for gaming and standard graphics jobs. AGP version costs $160.	650
4	Metabyte Wicked3D Vengeance 510/494-9700 www.wicked3d.com	NEW	$119	85	good	excellent	average	**FEATURES:** 16MB of SGRAM, 250-MHz RAMDAC, 3Dfx Voodoo Banshee chip, bundled 3D game. **SUMMARY:** Remarkably fast 3D performance qualifies this board for hot gaming, but it's short on useful utilities like color calibration and zoom.	651
5	Guillemot Maxi Gamer Phoenix 877/484-5536 www.guillemot.com	Jan 99	$110	83	good	excellent	average	**FEATURES:** 16MB of SGRAM, 250-MHz RAMDAC, 3Dfx Voodoo Banshee chip, bundled 3D games. **SUMMARY:** Although this card lacks zoom and virtual desktop utilities, it's a terrific value for users who dabble in graphics apps and play 3D games.	652
	AGP BOARD								
1	Matrox Millennium G200 800/844-8305 www.matrox.com/mga	Oct 98	$129	93	excellent	excellent	excellent	**FEATURES:** 8MB of SGRAM, 250-MHz RAMDAC, MGA-G200 chip, bundled 3D modeling and image editing tools. **SUMMARY:** Faster than its PCI sibling. To view games on a TV, consider Matrox's $129 Mystique G200 or the feature-rich $299 Marvel G200-TV.	653
2	STB Velocity 4400 800/234-4334 www.stb.com	Dec 98	$149	93	good	excellent	excellent	**FEATURES:** 16MB of SDRAM, 250-MHz RAMDAC, NVidia RIVA TNT chip, bundled 3D games, video editing tool, and graphics plug-ins. **SUMMARY:** Costs $50 less this month and performs well in 3D tasks, but a notch below the Matrox in mixed-media rating.	654
3	Diamond Viper V550 800/468-5846 www.diamondmm.com	NEW	$169	92	excellent	excellent	good	**FEATURES:** 16MB of SDRAM, 250-MHz RAMDAC, NVidia RIVA TNT chip, bundled graphics plug-ins, 3D game, plus tools for VRML authoring, 3D visualization, and photo editing. **SUMMARY:** Generous software bundle lands Viper in third. PCI version is $200.	655
4	Creative Labs Graphics Blaster RIVA TNT 800/998-5227 www.soundblaster.com	NEW	$170	92	good	excellent	good	**FEATURES:** 16MB of SDRAM, 250-MHz RAMDAC, NVidia RIVA TNT chip, no bundled software. **SUMMARY:** This Creative Labs card performs well and comes with weekend support, making it a nice option for both business and home users.	656
5	Hercules Terminator Beast 800/532-0600 www.hercules.com	Dec 98	$95	91	good	excellent	good	**FEATURES:** 8MB of SDRAM, 250-MHz RAMDAC, S3 Savage3D chip, no bundled software. **SUMMARY:** Excellent 3D performance and a low price make the Terminator Beast a good upgrade for gaming fanatics, but the company offers skimpy support.	657

Best Buy For reviews of products that didn't make the chart, visit www.pcworld.com/t10graphics. All products: 905

TEST PC WORLD CENTER **HOW WE TEST** We test boards under Windows 95. Business tests include PC WorldBench 98, a PowerPoint test, and a Macromedia Director script. Our 3D score is based on four games, each evaluated on frame rate and image quality. For AGP cards we add a texturing test using Caligari's TrueSpace3. We tested PCI boards in a Micron Millennia Mme PC with a Pentium MMX-233 and 32MB of RAM. AGP boards were tested in an NEC Direction 333 with a PII-333 and 64MB of RAM. Overall rating is based on performance (PCI 50 percent, AGP 55 percent), features (25 percent), price (PCI 15 percent, AGP 10 percent), and support policies (10 percent). For all scores, higher is better. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

OF THE FIVE new graphics cards entering the ring this month, two are true heavyweights: STB's Velocity 4400 triumphs over Matrox's Millennium G200 SD on the PCI chart, while the AGP version of the Matrox wins over the STB by a split decision. Among the other contenders, Metabyte's Wicked3D Vengeance PCI card lives up to its name with wickedly fast 3D performance, and new boards from Diamond and Creative Labs crack the AGP list. ■

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Color PageWorks PS, 5/98

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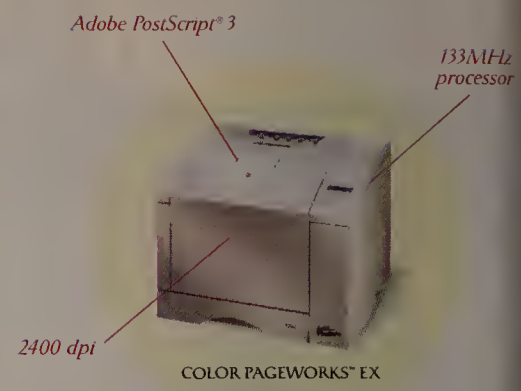

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PC WORLD

TOP 10 MODEMS

	INTERNAL V.90 MODEM	Month tested	Street price (11/23/98)	Overall rating	56-kbps downloads / 33.6-kbps transfers (min:sec per MB)	Comments	PC World InfoNet number
1	IBM 56K Modem Internet Kit 800/772-2227 www.ibm.com/pc/us/accessories	Jan 99	$99	80	3:33/5:57	**FEATURES:** Supports x2, 16-bit ISA card, V.80 videoconferencing, USR/TI chip set, distinctive ring, voice mail, speakerphone, DSVD, Caller ID, QuickLink Message Center III software. **SUMMARY:** A great SOHO modem, the 56K has voice features, excellent 56-kbps performance, and around-the-clock support.	–
2	Zoom FaxModem 56K PCI Dualmode 800/631-3116 www.zoomtel.com	Jan 99	$64	79	4:16/5:40	**FEATURES:** Supports K56flex, PCI card, Rockwell chip set, MNP-10EC error control, V.80 videoconferencing, voice mail, distinctive ring, Communicate software. **SUMMARY:** Top choice for SOHO on a strict budget. It's low-cost, has voice features, and is backed with long support hours. But it runs a little slow on 56-kbps transfers.	696
3	Diamond Multimedia SupraExpress 56i 800/468-5846 www.diamondmm.com	Jan 99	$100	78	3:41/5:41	**FEATURES:** Supports K56flex, 16-bit ISA card, Rockwell chip set, V.80 videoconferencing, distinctive ring, voice mail, speakerphone, Caller ID, FaxTalk Communicator software. **SUMMARY:** Excellent candidate for home offices; performs well and has lots of features; support reps available 14 hours each weekday and on Saturdays.	697
4	Amquest Host PCI 56K Dual Mode Voice/Speakerphone 800/237-9988 www.amquestmodem.com	NEW	$49	78	3:35/5:39	**FEATURES:** Supports K56flex, PCI card, MNP-10EC, V.80 videoconferencing, Rockwell chip set, voice mail, speakerphone, VoiceView, ASVD, DSVD, Caller ID, Amquest @fax.com software. **SUMMARY:** Ultra-low-cost; performs well and is packed with voice features, but it's hard to install and requires the COM2 assignment.	698
5	Viking V.90 56K ISA Modem 800/338-2361 www.vikingcomponents.com	NEW	$95	77	3:23/5:41	**FEATURES:** Supports K56flex, 16-bit ISA card, Rockwell chip set, voice mail, speakerphone, QuickLink III software. **SUMMARY:** ISA modem sports great 56-kbps performance, and Viking backs it with around-the-clock support. Just as well, because the modem's skimpy manual isn't much help.	699
6	Wisecom Accelerator Pro 56K Voice Fax Modem 888/947-3266 www.wisecominc.com	Jan 99	$80	77	3:48/5:39	**FEATURES:** Supports K56flex, 16-bit ISA card, Rockwell chip set, MNP-10EC, distinctive ring, voice mail, speakerphone, DSVD, ASVD, Caller ID, SuperVoice software. **SUMMARY:** Voice modem is reasonably priced, but tough-to-read manuals make it better for users who already know how to install and configure these devices.	700
7	Apache Micro Peripherals NetExpress 56K 800/330-1328 www.apache-micro.com	Jan 99	$88	76	3:46/5:42	**FEATURES:** Supports K56flex, 16-bit ISA card, Rockwell chip set, distinctive ring, voice mail, speakerphone, ASVD, Caller ID, MegaConnect Lite software. **SUMMARY:** This affordable modem comes with voice features, but the company limits support to 8 hours per day, weekdays only.	701
	EXTERNAL V.90 MODEM						
1	Diamond Multimedia SupraExpress 56e 800/468-5846 www.diamondmm.com	retested this month	$120	80	3:23/5:40	**FEATURES:** Supports K56flex, Rockwell chip set, V.80 videoconferencing, distinctive ring, voice mail, Caller ID, permanently attached serial cable, FaxTalk Communicator software. **SUMMARY:** Great all-around modem; affordable, easy to install, fastest external model here, small and portable, backed by long support hours.	702
2	E-Tech CyberBullet Modem E56K RVP 888/609-8885 www.e-tech.com	retested this month	$85	79	3:23/5:41	**FEATURES:** Supports K56flex, Rockwell chip set, V.80, distinctive ring, voice mail, speakerphone, ASVD, serial cable, earphones, Cheyenne BitWare software. **SUMMARY:** Costs less than other external modems here, has voice features, performs almost as well as the SupraExpress. But we found little help in its thin manuals.	703
3	Shark Multimedia Leopard XT-56K 800/800-3321 www.sharkmm.com	retested this month	$100	76	3:33/5:41	**FEATURES:** Supports K56flex, Rockwell chip set, MNP-10EC, distinctive ring, voice mail, speakerphone, VoiceView, ASVD, manual volume control, serial cable, Caller ID, DialTone software. **SUMMARY:** Low price for highly portable, loaded modem. But it can't support V.90 and K56flex at the same time.	704

Best Buy online For reviews of products that didn't make the chart, visit www.pcworld.com/t10modems. All products: 909

TEST PC WORLD CENTER **HOW WE TEST** We test V.90 (56-kbps) and V.34 (33.6-kbps) performance over a Telecomm Analysis Systems simulated phone network. We connect each modem to two common Internet service provider modems, Ascend's Max 6000 and 3Com's Total Control. Using each ISP modem, we perform two tests. In the Network Model Coverage test, we send a .zip file over several different line conditions. For the File Type test, we send a mix of four files—graphics, text, program, and compressed files—over one line condition. We average the results for the two ISP modems to calculate NMC and FT scores, which make up, respectively, 60 and 40 percent of the total performance score. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

WE REVISITED EXTERNAL modems using the speed tests that debuted last month (see "V.90 Modems: The End of the Line," www.pcworld.com/jan99/modems). Diamond's SupraExpress 56e still leads the pack, with great performance and features in an exceptionally small and light box. Meanwhile, IBM's 56K Modem Internet Kit remains our top internal modem—it's affordable, very fast, easy to install, and backed by 24-hour support. ■

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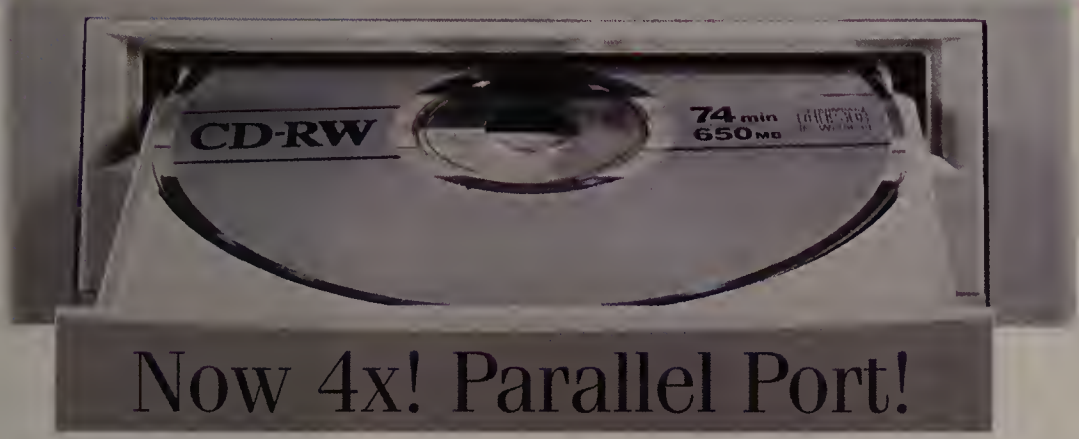

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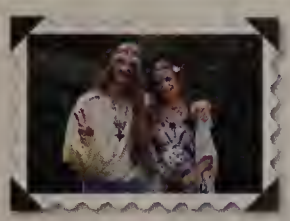

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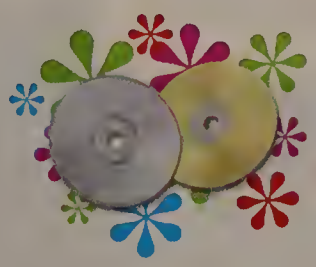

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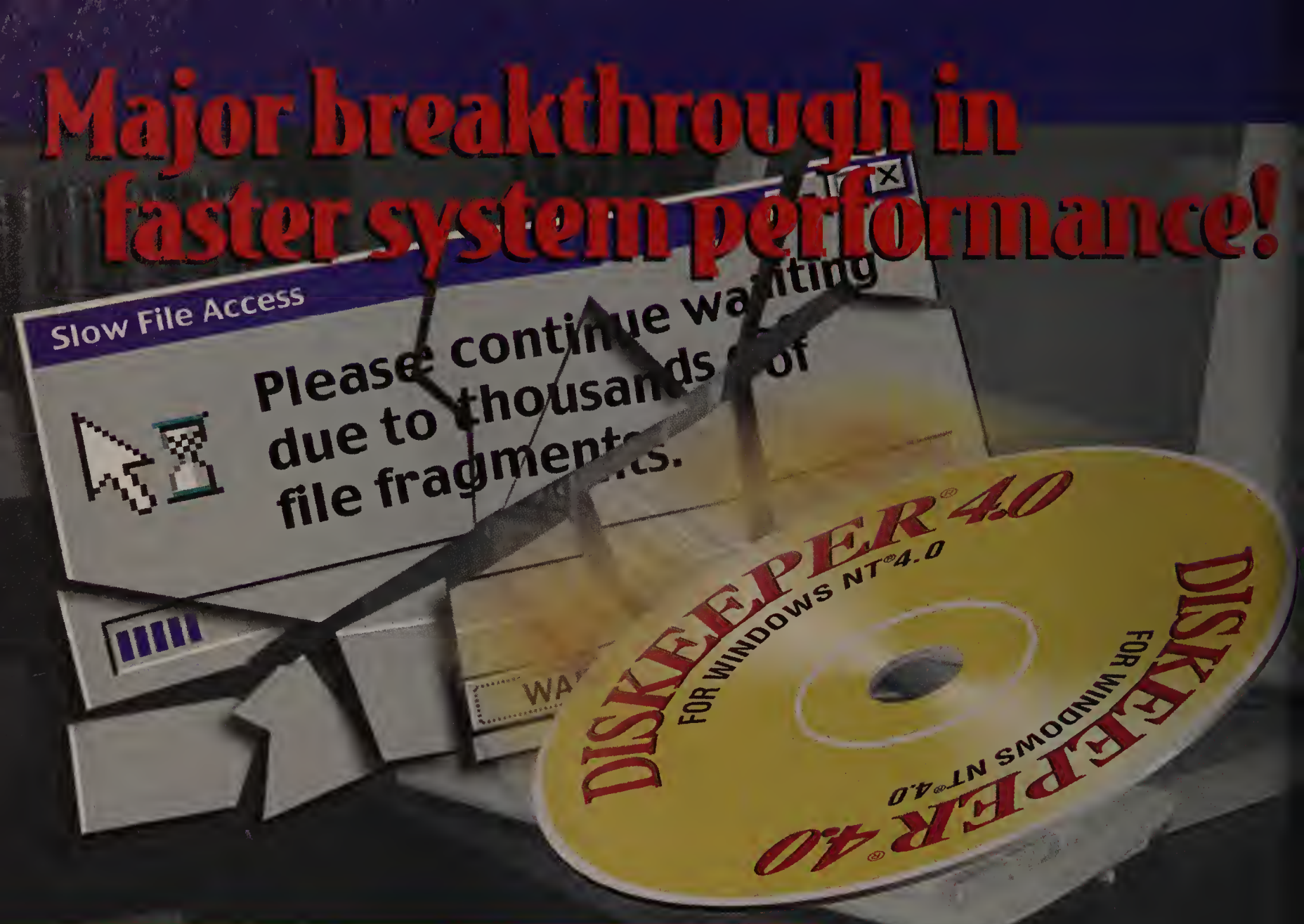

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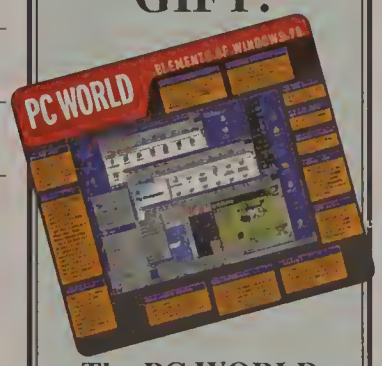

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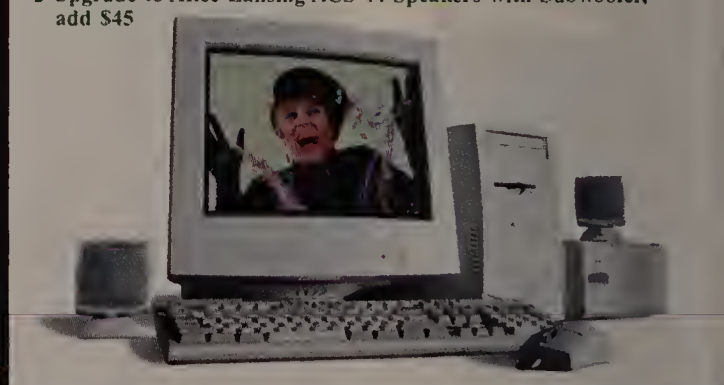

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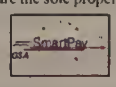

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HERE'S HOW

WINDOWS TIPS SCOTT DUNN

Format Floppies on the Fly

FLOPPY DISKS ARE almost universally reviled for being too slow and too small, yet almost everyone depends on them for backing up individual files and sharing data among computers. But formatting floppies is a chore. You have to open Explorer, then navigate to the floppy drive, and choose the Format command from a menu. This is where a batch file can come in handy.

If you just want to format a disk, fire up Notepad and type **format a: /autotest** (type **b:** instead of **a:** if that's the drive you want to use). Save the file to a desired folder as something like **fmt.bat**, making sure to use the three-letter BAT extension. (I keep a separate folder just for batch files.)

But be warned: The /autotest switch tells DOS to format a floppy disk without prompting you for confirmations. If you accidentally execute this batch file on a floppy containing data, use the DOS Unformat command to reverse the dire effects. Unfortunately, this rescue technique works only with Windows 3.*x* and DOS 6.*x*. If you use Windows 9*x*, look for the file 'mirror.com' on your hard disk. You may have to dig out your old DOS floppies and find a file called 'mirror.co_'. Start a DOS window (choose *Start•Programs•MS-DOS Prompt*), and at the C: prompt, type **expand a:\mirror.co_ c:\dos\mirror.com** (your path may differ), and then press **<Enter>**. Now open the fmt.bat file in Notepad and add the line **c:\dos\mirror a:** above the format line in Notepad. Mirror takes some space on the floppy, but it'll let you recover data after an unintended format.

Note that this batch file won't work with NT, nor will it allow for quick formatting. To overcome these limitations, change the format line to **format a: /q < c:\windows\cr.txt** (your path may be slightly different).

If you're not using NT, you can include the mirror line as before. Save and close the file. Now right-click an empty area of the folder identified in the command line (here, it's the Windows folder) and choose *New•Text Document*. Name it **cr.txt**. Double-click the new file to open it for editing. Press **<Enter>** twice to insert two carriage returns, then type **N** followed by **<Enter>** again. This will reply to the Format command's prompts. Save the file, and exit.

If you prefer to see the normal Windows Format dialog box (Windows 9*x* and NT only), right-click the *Start* button and click *Open* or *Explore*. Double-click *Programs*, then navigate to the folder from which you'd like to launch the formatter. Right-click an empty area and choose *New•Shortcut*. In the Command Line box, type **rundll32.exe shell32.dll,SHFormatDrive**, taking note of the lowercase/uppercase letters as shown (see **FIGURE 1**). Click *Next* and type a name for your shortcut (like **Floppy Formatter**). Click *Finish*. If you want, you can assign a keyboard shortcut to launch this formatter: Right-click the new icon, select *Properties*, click the *Shortcut* tab, then click in the 'Shortcut key' field and type a letter or number. The system will

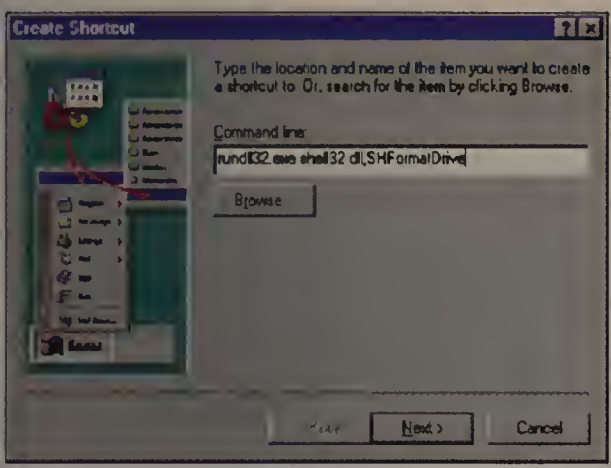

FIGURE 1: START THE WINDOWS format dialog box from a shortcut containing this command line.

automatically add 'Ctrl + Alt +' to what you type, and that key combination will be your keyboard shortcut. Whenever you want to format a floppy, just choose your new command from the Start menu or press its keyboard shortcut.

LOST IN DISK SPACE

FILE MANAGEMENT often requires knowing how much space your files occupy and how much disk space you have left. Here are some quick takes on making assessments:

Files only. Need to take stock of the number of files you have and the space they consume in a folder or drive? You'll need the status bar handy, so if it's not visible, choose *View•Status Bar* (in Explorer) or *Options•Status Bar* (in File Manager). If you're running NT or Windows 9*x*, make sure no files are selected to get a proper reading. To deselect all files, click an empty area of the folder (see **FIGURE 2**). Note that the status bar object count includes everything in the folder, including subfolders, but that the size listing does *not* count subfolders.

Files and folders. To get a measure of the files, folders, and subfolders occupying a drive or folder, do the following: In Windows 9*x* and NT, select the objects, right-click on one, and choose *Properties* (or press **<Alt>-<Enter>**). (If you care only about how many objects are in your selection, look at the status bar.) In Windows 3.*x*, display a folder in File Manager, choose *File•Search*, and make sure *.* appears in the Search For box (or change the file spec to analyze only a certain file type). Verify that *Search All Subdirectories* is selected and click *OK*. Press **<Ctrl>-/** to select all files in the Search Results window and choose *File•Properties*, or press **<Alt>-<Enter>** to see the Properties box that lists the number of files and the space they occupy.

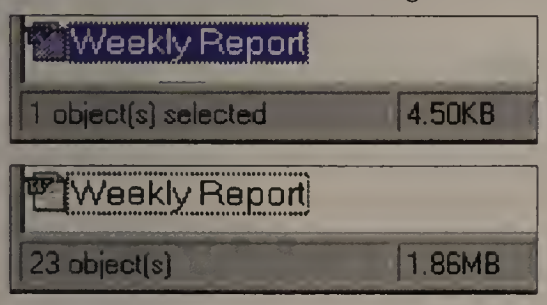

FIGURE 2: THE STATUS BAR shows the number and size of selected files in a folder (top) or of all files in the folder (bottom).

Free space. Often the question isn't how much space your files take up, but rather how much room is left. Open an Explorer window (the two-pane window in Windows 9*x* and NT) or click the left pane of File Manager. Then, with the status bar visible, deselect all objects as explained earlier. Another option is to select a folder in the tree pane to make the status bar show, among other things, the free space available on that disk or partition.

Graphic reminder. If you run Windows 9*x* or NT, you can get a pie chart representation of free and used disk space. In My Computer, right-click the icon for the disk you want to examine, and choose *Properties*. With Windows 98 or Internet Explorer 4, make sure *As Web Page* is checked on the View menu, and select a drive (in the right pane if you're using Explorer) to see the pie chart in the preview area.

RELOCATE WALLPAPER FILES

WALLPAPER GRAPHICS are a great way to customize your desktop. Unfortunately, Windows plunks wallpaper files into the Windows folder, amid the million other files located there. In IE 4 and Windows 98, Microsoft has added a folder just for wallpaper files (the Web\Wallpaper folder in your Windows folder). But if you already have your wallpaper files stored elsewhere, or for space reasons would prefer to keep them on another drive, you can designate a different folder for those image and HTML files. Prepare to fudge with the Windows Registry to do it, though.

Here's what to do: First, back up the following files in your Windows folder: user.dat, system.dat, user.dao, and system.dao. Next, choose *Start•Run*, type **regedit**, and press **<Enter>** to launch the Registry Editor. Travel down the folder tree in the left pane until you come to 'HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion'. With the CurrentVersion folder selected in the left pane, look in the right pane for an icon labeled 'WallPaperDir'. Double-click it and edit the path in the 'Value data' box to reflect your preferred wallpaper folder. Then click *OK* and exit the Registry Editor.

To see the effect, just right-click the desktop and choose *Properties*. With ▶

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the Background tab in front, the list of wallpapers you see should include all wallpaper-compatible files (.bmp, .gif, .jpg, and .html) in the Windows folder and in the folder you designated. And if you click

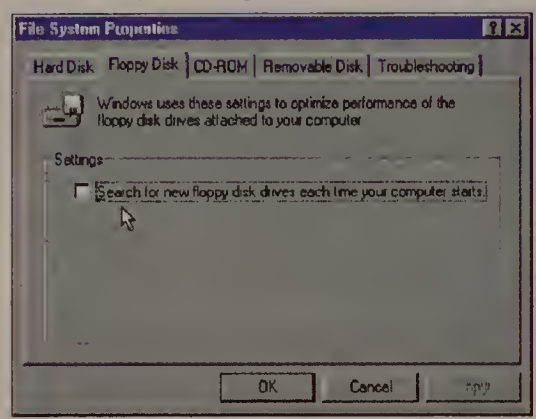


FIGURE 3: WINDOWS MAY start a wee faster if it doesn't update floppy info each time.

Browse, you'll see the contents of the folder containing the currently selected file in the list. Happy decorating.

SKIP THE FLOPPY BOOT CHECK

98 AT BOOT-UP, Windows 98 checks to see if a floppy drive is present, which adds a few seconds to the process. You can start your system a bit faster by bypassing this drive check.

Right-click *My Computer* and choose *Properties*. Click the *Performance* tab and then click *File System*. In the File System

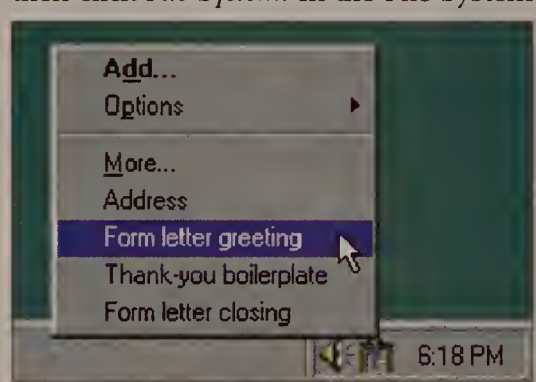


FIGURE 4: ADD FREQUENTLY USED text to the Clipboard instantly with ClipTray.

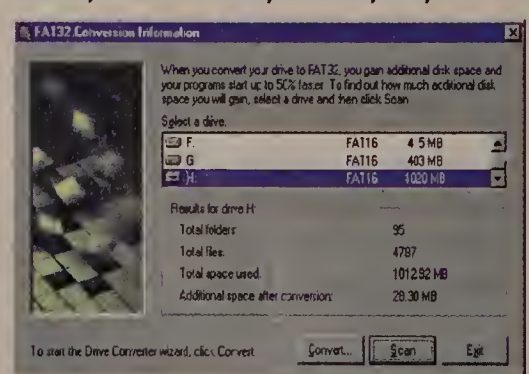


FIGURE 5: SEE HOW MUCH space you can gain on your hard disk with FAT32.

Properties dialog box, click the *Floppy Disk* tab. Then uncheck *Search for new floppy disk drives each time your computer starts* (see **FIGURE 3**). You may need to press **<F5>** in My Computer to refresh the floppy drive listing after each boot.

HIDDEN TREASURES

98 NOT ALL of the new utilities in Win 98 are available on the Start menus. But if you have the Windows 98 upgrade CD, you can install the Windows 98 Resource Kit Sampler, which includes the following little programs of varying usefulness:

ClipTray lets you place frequently used text into the Windows Clipboard, so you can paste it into documents—great for entering boilerplate copy. To select a saved text element, just right-click the *ClipTray* icon in the Windows 9*x* taskbar tray (see **FIGURE 4**). Put ClipTray in your StartUp folder to keep it running every day.

Fat32 Conversion Information estimates how much disk space you'll gain by converting your drive to FAT32 (see **FIGURE 5**).

Link Check Wizard analyzes all your Windows shortcuts and determines which ones no longer point to existing files or applications. Select the ones you want to remove, click *Finish*, and your system is suddenly a little tidier. This tool is a handy little housecleaner, particularly if program uninstalls leave a boneyard of dead shortcuts in your Start button's Program area.

Microsoft File Information may not answer every question you have about your Windows installation, but if you can cope with the geekspeak, it can show you which .cab archive houses which files.

QuickTray lets you add application or file icons to the system tray for one-click launching of your key files or applications.

TextViewer is just what its name implies—a basic way to view the contents of .htm, .txt, .ini, .inf, .bat, or other text-only files (.html files appear as HTML code, not as they would in a browser). Unfortunately, it suffers from the same file-size limitations as Notepad.

Tweak UI is the indispensable Control Panel icon for customizing the Windows interface, the same one you get if you download the free Microsoft PowerToys from FileWorld (www.fileworld.com/magazine). Tweak UI lets you hide desktop icons or erase telltale history lists, prevents "Shortcut to" from being added to all your shortcut names, and replaces tiny icons with large ones (to relieve eyestrain).

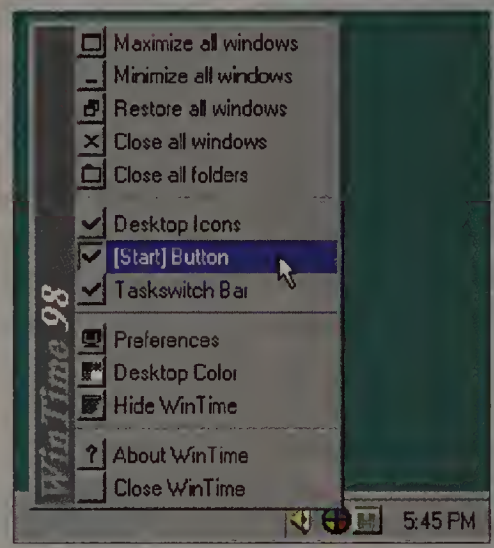
WinDiff has an awkward interface, but it's a handy tool for comparing two text files or two directories, highlighting the differences in color. It's great for puzzling through multiple .ini file updates or dueling config.sys files. WinDiff even compares Explorer file listings.

online *Find more tips on PC World Online at www.pcworld.com/heres_how, and files from this article at www.fileworld.com/magazine.* Windows Tips *pay $50 for published questions and tips. Scott Dunn is a contributing editor for* PC World *and a principal author of* The PC Bible, 2nd Edition *(Peachpit Press, 1995).* *See page 14 for contact information.* ■

WINDOWS TOOLBOX

Good Things in a Small Package

WINTIME IS YET ANOTHER utility yearning to occupy space in your taskbar's tray area. Its many functions let you hide windows or make them stay on top, hide buttons on the taskbar, hide the Start button, and even hide its own tray icon (a great way to discourage tampering on demo or classroom PCs). Other options allow you to start the screen saver from a customizable "hot corner," or schedule task reminders. You can display a menu for digging up buried windows, and for minimizing, maximizing, restoring, or closing applications. Download it for free from PC World Online's FileWorld (www.fileworld.com/magazine).



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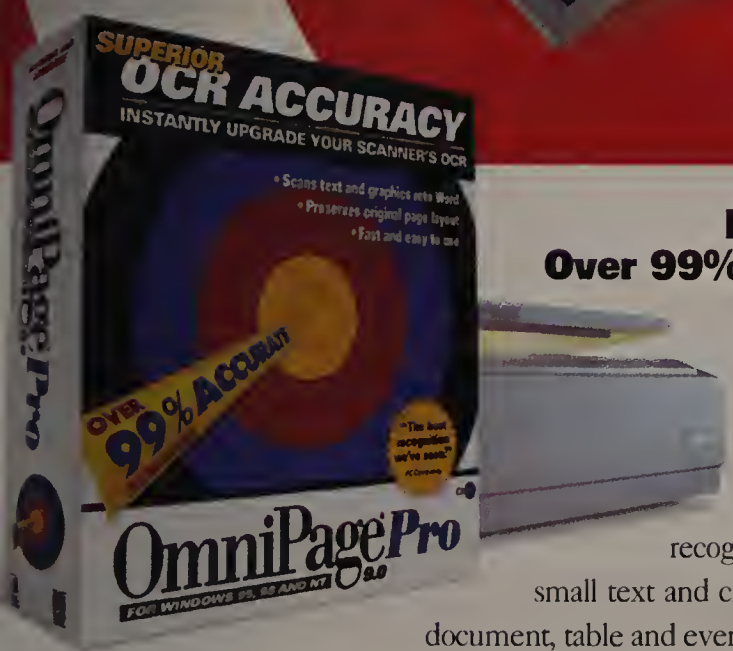

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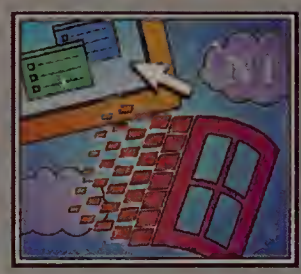
How to Run Both NT and Windows 95/98

SWITCHING OPERATING systems is a gut-wrenching decision. Even if the upgrade works, you face a steep learning curve and a litany of hardware and software hassles: NT may spell curtains for games and utilities, and will inactivate nifty Universal Serial Bus devices. The solution: Keep Windows 9*x* as you move to NT, and choose which OS to run at start-up.

HAPPY TOGETHER

YOU CAN RUN NT alongside Win 9*x* or even Win 3.*x* by pointing to a directory other than the existing Windows directory when you install NT. But first decide how you will manage data and applications on your dual-boot system, since each OS works with disk drives in its own way. If you want NT and Win 9*x* or 3.*x* to have free access to all files and partitions, you must sacrifice some features. NT's own File System (NTFS) offers password-protected file access and on-the-fly file- and folder-level compression (for selectively saving disk space). Win 98 and OSR2 versions of Win 95 feature the FAT32 file system, which includes efficient file storage and the ability to defragment as needed. Unfortunately, NT won't recognize FAT32 disk partitions, and Win 9*x* can't make sense of NTFS. (All versions of Win 9*x* and NT support FAT16, the file system found in the original Win 95 and 3.*x*.)

So what should you do? You can install NT onto the same disk and partition as Win 9*x*, but the partition must be formatted in FAT16. Because FAT16 can only handle partitions that are 2GB or smaller, large hard disks will be split into three or more partitions (which get separate drive letters). Install NT and Win 9*x* to different partitions, and you can adopt an optimized file system for each OS and use larger partitions.



Dual-booters must also contend with program installation. When you add Windows NT to your PC, you must reinstall all your applications—the NT Registry won't take configuration data from the Windows 9*x* Registry. To avoid keeping duplicate program files on your hard disk, when you reinstall those apps, direct the setup programs to write files to the application directory that already exists for Win 9*x*. Remember, format your Win 9*x* partition using FAT16; otherwise you won't see the existing program directories from NT. See **FIGURE 1** for more on this.

TAILOR YOUR DUAL-BOOT START-UP

IN A DUAL-BOOT setup, your system will boot by default into Win 9*x*. But before it does, a 30-second delay gives you time to select another OS from a list of installed operating systems. If you want, you can speed up the 30-second delay from the NT System Properties box:

1. Click *Start•Settings•Control Panel.*
2. Open the *Systems* icon.
3. In the System Properties dialog box, click the *Startup/Shutdown* tab.
4. From the Startup drop-down list, select the operating system to which you wish to boot by default.
5. In the 'Show list for' field, enter the time in seconds you want the OS list to appear before the default OS loads. Then click *OK.*

To force the system to wait until you pick an OS, modify the file boot.ini in the root directory of your NT partition. Open the file using Notepad or another text editor, and find the line that starts with 'Timeout='. Change the numeric value in this line to **-1**, which NT interprets as an indefinite amount of time. Note: The 'Show list for' item in the Startup/Shutdown sheet rejects negative values. You must enter it directly into boot.ini.

Windows NT pays $50 for published questions and tips. Michael Desmond is a freelance writer and consultant. See page 14 for contact information. ■

Assess NT's Performance

WINDOWS NT Performance Monitor provides detailed performance data, but a quicker way to obtain that information is from the Windows NT Task Manager. Right-click the taskbar, select *Task Manager,* and click the *Performance* tab. You will see real-time graphs and data on CPU and memory usage. To track CPU activity without hogging screen space, click *Options•Hide When Minimized,* and minimize the Task Manager window. A small icon in the taskbar tray will now graph CPU usage.

MICROSOFT'S FILE SYSTEMS: HOW TO TELL THEM APART

NT uses...	Win 9*x* uses...	Result	Scenario
FAT16	FAT16	Best compatibility, worst file system efficiency, poor security.	Best for users switching freely between NT and 9*x*. From either OS you can access all partitions and files, and a single installation base can be used to run applications.
NTFS	FAT16	Good compatibility and security, preserves NT file security and compression features.	Best for NT-centric users. From NT you can access all partitions and files, and applications can run under both NT and 9*x* from a single FAT16 installation base. From Windows 9*x* you will not be able to see the NTFS partition.
FAT16	FAT32	Poor application compatibility, poor NT security, no NT file features.	Best for Windows 9*x*-centric users. Under Win 9*x* you can access all partitions and files, but under NT you won't see the Windows 9*x* partition. What's more, NT sessions will lack useful NTFS file features.
NTFS	FAT32	Worst compatibility, best security, optimal file system features for each OS.	Best for a shared home-office PC. Any program you run under both NT and 9*x* must be installed separately in each partition. That prevents an application uninstall (or corruption) in Win 9*x* from affecting your NT-based partition.

FIGURE 1: ONE USER'S IDEAL FILE SYSTEM may not meet the needs of another—the reason why Microsoft offers three partition types.

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- *NEW* 19" (18.0" viewable, .26dp) Trinitron P990 Monitor
- 8MB STB nVidia 3D AGP Graphics Card
- 40X Max≈ Variable CD-ROM Drive
- Crystal 3D 64V Wavetable Sound
- harman/kardon HK-195 Speakers
- 3Com 3C905B 10/100 NIC
- APC SurgeStation Pro8T2
- MS IntelliMouse
- ★ *Upgrade to a NEW 17.2GB Ultra ATA Hard Drive, add $119.*
- ★ *Upgrade to a 16MB STB nVidia TNT 3D AGP Graphics Card, add $35.*

$2279

Business Lease◊: $86/Mo., 36 Mos.

E•VALUE CODE: 03595-590122

DELL DIMENSION XPS R400
PENTIUM II PROCESSOR AT 400MHz

- 96MB 100MHz SDRAM
- 512KB Integrated L2 Cache
- *NEW* 12.9GB Ultra ATA Hard Drive
- 19" (17.9" viewable, .26dp) 1200HS Monitor
- 16MB STB nVidia TNT 3D AGP Graphics Card
- 40X Max≈ Variable CD-ROM Drive
- Crystal 3D 64V Wavetable Sound
- harman/kardon HK-195 Speakers
- APC SurgeStation Pro8T2
- MS IntelliMouse
- ★ *Upgrade to 128MB 100MHz SDRAM, add $69.*
- ★ *Iomega Zip 100MB Internal Drive with Two Cartridges, add $99.*
- ★ *3Com 3C905B 10/100 NIC, add $50.*

$1999

Business Lease◊: $76/Mo., 36 Mos.

E•VALUE CODE: 03595-590119a

DELL DIMENSION V350
PENTIUM II PROCESSOR AT 350MHz

- 96MB 100MHz SDRAM
- 512KB Integrated L2 Cache
- *NEW* 12.9GB Ultra ATA Hard Drive
- 17" (16.0" viewable, .26dp) Trinitron 1000HS Monitor
- 8MB ATI 3D AGP Graphics
- 32X Max^ Variable CD-ROM Drive
- Yamaha XG 64V Wavetable Sound
- harman/kardon HK-195 Speakers
- Iomega Zip 100MB Internal Drive
- Logitech First Mouse+ Wheel (PS/2v)
- ★ *Upgrade to a 19" (17.9" viewable, .26dp) 1200HS Monitor, add $99.*

$1749

Business Lease◊: $66/Mo., 36 Mos.

E•VALUE CODE: 03595-590117a

DELL DIMENSION V333c
INTEL® CELERON™ PROCESSOR AT 333MHz

Network-Designed Desktop

- 64MB SDRAM
- 128KB Integrated L2 Cache
- 8.4GB Ultra ATA Hard Drive
- 17" (15.9" viewable) 1000LS Monitor
- 8MB ATI 3D AGP Graphics
- 32X Max^ Variable CD-ROM Drive
- Turtle Beach Montego A3D 64V Sound Card
- harman/kardon HK-195 Speakers
- Integrated Intel 10/100 Ethernet Controller
- Logitech First Mouse+ Wheel (PS/2v)

$1379

Business Lease◊: $52/Mo., 36 Mos.

E•VALUE CODE: 03595-590113

POWER UPGRADES

- Iomega Zip 100MB Internal Drive with Two Cartridges, add $99.
- 3Com USRobotics V.90π PCI Telephony WinModem, add $49.
- 3Com 3C905B 10/100 NIC, add $50.
- Intuit QuickBooks v6.0 Pre-installed, add $118.
- 3-Year Next-Business-Day On-site△ Service, add $99.

Prices valid with system purchase only.

DELL DIMENSION AWARD INFO

- Since 1990, *PC Computing* has given Dell Dimension systems more MVP awards than any other desktop line in the category.
- Winner of the 1998 *PC Computing* MVP "State-of-the-Art Desktop" (XPS R450) and "High-Performance PC" award (XPS R400).
- Three-time "A" rating in *PC Magazine*'s Readers' Choice Awards for Service and Reliability (1996-1998).
- Received the highest "Buy Again" ratings from *Windows Magazine*'s 1998 Tech Support Survey.

Advertised configurations vary from award-winning configurations.

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- Microsoft Windows® 98
- Dell QuietKey® Keyboard
- 3-Year Limited Warranty†
- 1-Year On-site△ Service

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- **Add an HP OfficeJet 600 Multifunction Printer for only**
  $349
  $399 – $50 MAIL-IN REBATE‡
- **Add an HP ScanJet 4100Cse for only**
  $149
  $199 – $50 MAIL-IN REBATE‡

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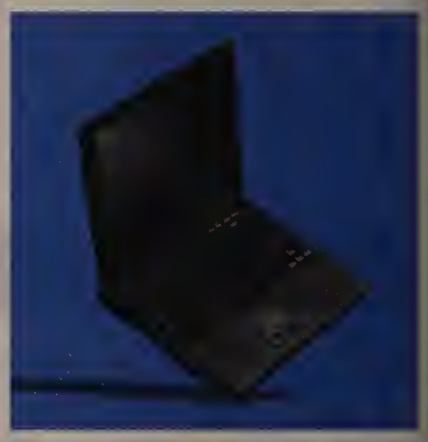

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pentium® II

TIME.

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PENTIUM II PROCESSOR AT 300MHz
FEATURING MMX™ TECHNOLOGY

All-in-One Multimedia Performance
- 15" XGA Active Matrix Display
- 96MB SDRAM (384MB Max*)
- 4GB Ultra ATA Hard Drive
- Removable Combo 2X DVD-ROM and Floppy Drive
- 2X AGP 8MB ATI RAGE Pro 3D Video
- 3D Surround Sound and Hardware Wavetable
- 12-Cell Intelligent Lithium Ion Battery
- Internal 56K Capable™ V.90 Fax Modem
- Trial Offer ConnectDirect℠ Internet Access
- MS® Office 97 SBE (Call about Our *FREE* MS Office 2000 Upgrade Offer)
- Microsoft® Windows® 98/Touchpad
- 3-Year Limited Warranty†

$3199

Business Lease◊: $121/Mo., 36 Mos.

E•VALUE CODE: 03596-890131

DELL INSPIRON 7000 D300LT
PENTIUM II PROCESSOR AT 300MHz
FEATURING MMX TECHNOLOGY

All-in-One Multimedia Performance
- 15" XGA Active Matrix Display
- 64MB SDRAM (384MB Max*)
- 4GB Ultra ATA Hard Drive
- Removable Combo 24X Max^^ Variable CD-ROM and Floppy Drive
- 2X AGP 8MB ATI RAGE Pro 3D Video
- 3D Surround Sound and Hardware Wavetable
- 12-Cell Intelligent Lithium Ion Battery
- Internal 56K Capable™ V.90 Fax Modem
- Trial Offer ConnectDirect℠ Internet Access
- MS Office 97 SBE (Call about Our *FREE* MS Office 2000 Upgrade Offer)
- Microsoft Windows 98/Touchpad
- 3-Year Limited Warranty†

$2899

Business Lease◊: $110/Mo., 36 Mos.

E•VALUE CODE: 03596-890128

DELL INSPIRON 7000 D300GT
PENTIUM II PROCESSOR AT 300MHz
FEATURING MMX TECHNOLOGY

All-in-One Multimedia Performance
- 14.1" XGA Active Matrix Display
- 32MB SDRAM (384MB Max*)
- 4GB Ultra ATA Hard Drive
- Removable Combo 24X Max^^ Variable CD-ROM and Floppy Drive
- 2X AGP 4MB ATI RAGE Pro 3D Video
- 3D Surround Sound and Hardware Wavetable
- 12-Cell Intelligent Lithium Ion Battery
- Deluxe Nylon Case
- MS Office 97 SBE (Call about Our *FREE* MS Office 2000 Upgrade Offer)
- Microsoft Windows 98/Touchpad
- 3-Year Limited Warranty†

★ *Upgrade to 64MB SDRAM, add $99.*

$2699

Business Lease◊: $102/Mo., 36 Mos.

E•VALUE CODE: 03596-890126

DELL INSPIRON 3500 D266GT
PENTIUM II PROCESSOR AT 266MHz
FEATURING MMX TECHNOLOGY

Light Weight, Light Price
- 14.1" XGA Active Matrix Display
- 32MB SDRAM (256MB Max)
- 4.3GB Ultra ATA Hard Drive
- Modular 24X Max^^ Variable CD-ROM
- Modular Floppy Drive
- NeoMagic MediaMagic 256AV AGP Video
- 3D Surround Sound and Software Wavetable
- 9-Cell Intelligent Lithium Ion Battery
- APC SurgeArrest Notebook Pro
- MS Office 97 SBE (Call about Our *FREE* MS Office 2000 Upgrade Offer)
- Microsoft Windows 98/Touchpad
- 3-Year Limited Warranty†

$2379

Business Lease◊: $90/Mo., 36 Mos.

E•VALUE CODE: 03596-890123a

DELL INSPIRON 3500 D233XT
PENTIUM II PROCESSOR AT 233MHz
FEATURING MMX TECHNOLOGY

Light Weight, Light Price
- 13.3" XGA Active Matrix Display
- 32MB SDRAM (256MB Max)
- 3.2GB Ultra ATA Hard Drive
- Modular 24X Max^^ Variable CD-ROM
- Modular Floppy Drive
- NeoMagic MediaMagic 256AV AGP Video
- 3D Surround Sound and Software Wavetable
- 9-Cell Intelligent Lithium Ion Battery
- MS Office 97 SBE (Call about Our *FREE* MS Office 2000 Upgrade Offer)
- Microsoft Windows 98/Touchpad
- 3-Year Limited Warranty†

$1999

Business Lease◊: $76/Mo., 36 Mos.

E•VALUE CODE: 03596-890119

DELL LATITUDE® CPi D300XT
PENTIUM II PROCESSOR AT 300MHz
FEATURING MMX TECHNOLOGY

Network-Optimized Notebook
- 13.3" XGA Active Matrix Display
- 96MB EDO RAM (256MB Max)
- 4GB Ultra ATA Hard Drive
- Modular 24X Max^^ Variable CD-ROM
- Modular Floppy Drive
- NeoMagic 128-bit Graphics Accelerator
- 3D Surround Sound and Software Wavetable
- Intelligent Lithium Ion Battery with ExpressCharge™ Technology
- MS Windows NT® Workstation 4.0
- Touchpad
- 3-Year Limited Warranty†
- 1-Year NBD On-site△ Service

$2999

Business Lease◊: $114/Mo., 36 Mos.

E•VALUE CODE: 03596-790129

DELL LATITUDE CP M233ST
PENTIUM PROCESSOR WITH MMX TECHNOLOGY AT 233MHz

Network-Optimized Notebook
- 12.1" SVGA Active Matrix Display
- 32MB EDO RAM (128MB Max)
- 4GB Ultra ATA Hard Drive
- Modular 20X Max°° Variable CD-ROM
- Modular Floppy Drive
- NeoMagic 128-bit Graphics Accelerator
- 3D Surround Sound and Software Wavetable
- Intelligent Lithium Ion Battery with ExpressCharge Technology
- MS Windows NT Workstation 4.0
- Touchpad
- 3-Year Limited Warranty†
- 1-Year NBD On-site△ Service

$2199

Business Lease◊: $83/Mo., 36 Mos.

E•VALUE CODE: 03596-790121

DELL NOTEBOOK AWARD INFO††
- Two-time "A" rating in *PC Magazine*'s Readers' Choice Awards for Service and Reliability.
- Latitude Line – *PC Computing*'s "Best Overall" Rating Three Years.
- Inspiron 7000 D300GT – *CNET* Editors' Choice.

Advertised configurations vary from award-winning configurations.

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intel inside
pentium® II PROCESSOR

PEOPLE.

DELL® POWEREDGE® 2300 SERVER
PENTIUM® II PROCESSOR AT 350MHz
(DUAL PROCESSOR/RAID CAPABLE)

- 64MB 100MHz ECC SDRAM
- 512KB Integrated L2 ECC Cache
- 4GB Ultra-2/LVD SCSI Hard Drive (Hot-Swap Optional)
- 32X Max^ Variable SCSI CD-ROM Drive
- HP® OpenView™ NNM Special Edition
- Intel® Pro/100+ PCI Ethernet Adapter
- Integrated Ultra-2/LVD and Ultra/Narrow SCSI Controllers
- 6 Expansion Slots: 4 PCI, 2 PCI/ISA
- 4-1.6" or 6-1" Hard Drive Bays
- 3 External 5.25" Drive Bays plus Dedicated 3.5" Floppy Drive Bay
- 3-Year NBD On-site^Δ Service
- 7x24 Dedicated Server Hardware Technical Telephone Support
- ★ *Upgrade to a Pentium II Processor at 400MHz, add $300.*

$2449

Business Lease◊: $93/Mo., 36 Mos

E•VALUE CODE: 03597-290124

DELL POWEREDGE 2300 SERVER
PENTIUM II PROCESSOR AT 400MHz
(DUAL PROCESSOR/RAID CAPABLE)

- 128MB 100MHz ECC SDRAM
- 512KB Integrated L2 ECC Cache
- 9GB Ultra-2/LVD SCSI Hard Drive (Hot-Swap Optional)
- 32X Max^ Variable SCSI CD-ROM Drive
- Microsoft® Windows NT® Server 4.0 (10 Client Access Licenses)
- HP OpenView NNM Special Edition
- Intel Pro/100+ PCI Ethernet Adapter
- Integrated Ultra-2/LVD and Ultra/Narrow SCSI Controllers
- 6 Expansion Slots: 4 PCI, 2 PCI/ISA
- 4-1.6" or 6-1" Hard Drive Bays
- 3 External 5.25" Drive Bays plus Dedicated 3.5" Floppy Drive Bay
- 3-Year NBD On-site^Δ Service
- 7x24 Dedicated Server Hardware Technical Telephone Support

$3999

Business Lease◊: $151/Mo., 36 Mos.

E•VALUE CODE: 03597-290139

DELL POWEREDGE 2300 SERVER
PENTIUM II PROCESSOR AT 450MHz
(RAID 5 CONFIGURATION)

- 128MB 100MHz ECC SDRAM
- 512KB Integrated L2 ECC Cache
- Three 9GB Ultra-2/LVD SCSI Hot-Swap Hard Drives
- Ultra-2/LVD PowerEdge Expandable RAID Controller 2/SC
- 32X Max^ Variable SCSI CD-ROM Drive
- HP OpenView NNM Special Edition
- Intel Pro/100+ PCI Ethernet Adapter
- Integrated Ultra-2/LVD and Ultra/Narrow SCSI Controllers
- 6 Expansion Slots: 4 PCI, 2 PCI/ISA
- 6-1" Hard Drive Bays
- 3 External 5.25" Drive Bays plus Dedicated 3.5" Floppy Drive Bay
- 3-Year NBD On-site^Δ Service
- 7x24 Dedicated Server Hardware Technical Telephone Support

$5499

Business Lease◊: $202/Mo., 36 Mos.

E•VALUE CODE: 03597-290154

NEW DELL POWEREDGE 4300 SERVER
PENTIUM II PROCESSOR AT 450MHz
(DUAL PROCESSOR/RAID CAPABLE)

- 128MB 100MHz ECC SDRAM
- 512KB Integrated L2 ECC Cache
- 18GB Ultra-2/LVD SCSI Hard Drive (Hot-Swap Optional)
- 32X Max^ Variable SCSI CD-ROM Drive
- HP OpenView NNM Special Edition
- Intel Pro/100+ PCI Ethernet Adapter
- Integrated Ultra-2/LVD and Ultra/Narrow SCSI Controllers
- Redundant Hot-Swap Power Supplies, Cooling Fans and Processor Fans
- 6 Expansion Slots: 4 PCI, 2 PCI/ISA
- 10 Bays: 6 Drive Bays, 4 Media Bays
- 3-Year NBD On-site^Δ Service
- 1-Year DirectLine℠ Network Operating System Support
- 7x24 Dedicated Server Hardware Technical Telephone Support

$5999

Business Lease◊: $220/Mo., 36 Mos.

E•VALUE CODE: 03597-290159

NEW DELL POWEREDGE 4300 SERVER
DUAL PENTIUM II PROCESSORS AT 350MHz
(DUAL PROCESSOR/RAID 5 CONFIGURATION)

- 128MB 100MHz ECC SDRAM
- 512KB Integrated L2 ECC Cache
- Three 9GB Ultra-2/LVD SCSI Hot-Swap Hard Drives
- Ultra-2/LVD PowerEdge Expandable RAID Controller 2/SC
- 32X Max^ Variable SCSI CD-ROM Drive
- HP OpenView NNM Special Edition
- Intel Pro/100+ PCI Ethernet Adapter
- Integrated Ultra-2/LVD and Ultra/Narrow SCSI Controllers
- Redundant Hot-Swap Power Supplies, Cooling Fans and Processor Fans
- 6 Expansion Slots: 4 PCI, 2 PCI/ISA
- 10 Bays: 6 Drive Bays, 4 Media Bays
- 3-Year NBD On-site^Δ Service
- 1-Year DirectLine NOS Support
- 7x24 Dedicated Server Hardware Technical Telephone Support

$7449

Business Lease◊: $270/Mo., 36 Mos.

E•VALUE CODE: 03597-290174

DELL POWEREDGE 6300 SERVER
PENTIUM II XEON™ PROCESSOR AT 400MHz
(QUAD PROCESSOR CAPABLE)

- 128MB ECC EDO Memory
- 512KB Integrated L2 Cache/Processor
- Three 9GB Ultra-2/LVD SCSI Hot-Swap Hard Drives
- Ultra-High Performance 64-bit Ultra-2/LVD PowerEdge Expandable RAID Controller 2
- 32X Max^ Variable SCSI CD-ROM Drive
- HP OpenView NNM Special Edition
- Intel Pro/100+ PCI Ethernet Adapter
- Integrated Dual Ultra-2/LVD and Ultra/Narrow SCSI Controllers
- Redundant Hot-Swap Power Supplies, Cooling Fans and Processor Fans
- 7 Expansion Slots: 4x64-bit, 3x32-bit
- 10 Bays: 6 Drive Bays, 4 Media Bays
- 3-Year NBD On-site^Δ Service
- 1-Year DirectLine NOS Support
- 7x24 Dedicated Server Hardware Technical Telephone Support

$11,899

Business Lease◊: $421/Mo., 36 Mos.

E•VALUE CODE: 03597-290101

For added redundancy and increased availability, turn to the PowerEdge 4300 and 6300 servers. Call for details.

DELL SERVER AWARD INFO††

- *Network World* "World Class Award" for flexibility, serviceability and manageability – Dell PowerEdge 2300.
- *Computer Shopper* "Top 100" – Dell PowerEdge 2300.
- *PC Computing*'s "The 'A' List" – Dell PowerEdge 6300.

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pentium® II xeon™ PROCESSOR

DELL PRECISION™ WORKSTATION 610

NEW PENTIUM® II XEON™ PROCESSOR AT 450MHz
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- 128MB 100MHz ECC SDRAM
- 512KB Full-Speed Integrated L2 Cache
- 9GB Ultra-2/LVD SCSI Hard Drive
- 21" (19.8" viewable, .26dp) Trinitron® 1600HS Monitor
- 3D*labs* Oxygen GMX 2000 Graphics Card
- 40X Max≈ Variable CD-ROM Drive
- Sound Blaster Pro Compatible Sound
- 3Com® 10/100 PCI NIC
- Remote Client Manageability Support via DMI 2.0; Wakeup on LAN Capable
- **MS® Windows NT® 4.0 and 1-Year NT Telephone Support**
- 3-Year NBD On-site△ Service
- 7x24 Dedicated Workstation Hardware Telephone and Online Technical Support

$5979

Business Lease◊: $220/Mo., 36 Mos.

E•VALUE CODE: 03598-490159

DELL PRECISION WORKSTATION 410

PENTIUM II PROCESSOR AT 400MHz
(DUAL PROCESSOR/RAID CAPABLE)

- 128MB 100MHz ECC SDRAM
- 512KB Integrated L2 Cache
- 4GB Ultra-2/LVD SCSI Hard Drive
- 17" (15.9" viewable) 1000LS Monitor
- Diamond 8MB AGP Graphics Card
- 40X Max≈ Variable CD-ROM Drive
- Sound Blaster Pro Compatible Sound
- harman/kardon HK-195 Speakers
- 3Com 10/100 PCI NIC
- Remote Client Manageability Support via DMI 2.0; Wakeup on LAN Capable
- **MS Windows NT 4.0 and 1-Year NT Telephone Support**
- 3-Year NBD On-site△ Service
- 7x24 Dedicated Workstation Hardware Telephone and Online Technical Support

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Business Lease◊: $114/Mo., 36 Mos.

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- MS [illegible] Telephone Support
- **3-Year NBD On-site^ Service**
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Business Lease◊: $83/Mo., 36 Mos.

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Dell Dimension XPS R MiniTower
Pentium® II processor, 450MHz with 512KB L2 Cache

Memory
128MB SDRAM

Hard Drive HELP ME CHOOSE
14.4GB Ultra ATA Hard Drive (7200 RPM)

Monitor HELP ME CHOOSE
21" (19.8" viewable, .26dp Trinitron® 1600HS Monitor [add $531]

Video Card HELP ME CHOOSE
NEW 16MB STB nVidia TNT 3D AGP Graphics Card

Please review the following regarding your Video selection:
: Not available on the 4.8X DVD with Software Decoding

DVD-ROM or CD-ROM Drive HELP ME CHOOSE
4.8X DVD ROM Drive and Decoder Card

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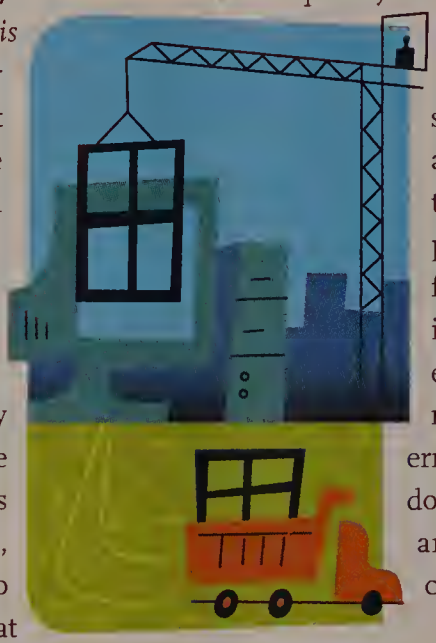
YOUR QUESTIONS ON: Going back to Windows 95 ◆ Saving electricity

Reinstate Windows 95, Ever So Patiently

I'VE BEEN HAVING problems with Window 98 and want to go back to Windows 95. I'd upgraded to FAT32, which my version of Windows 95 doesn't support, so I tried to use a third-party utility to reconvert to FAT16. But now when I try to reinstall Windows 95, a dialog box warns me that if I proceed I could render both operating systems useless. Is there any way I can return to Windows 95 safely?

Bill Schaper, St. Louis

ONCE YOU convert your system to FAT32, you can't easily go back. (Read more about these file systems in *Windows NT* on page 236.) Here's a step-by-step way to restore Windows 95, but the job is dangerous and difficult—and it may not even work. If you have all your application disks and can back up your data, the best option may be to count your losses, reformat the hard disk, and reinstall everything.

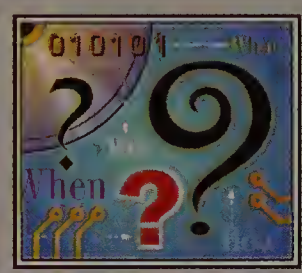


Assuming you want to proceed with the attempted rescue, you first need to back up all your data and key configuration information (including stuff like Internet access settings and passwords). To get started, select *Start•Shutdown•Restart in MS-DOS mode.* Place your Windows 95 CD into its drive, and at the DOS prompt, type ***d:*setup**, where *d:* is your CD-ROM drive. When asked if you really want to do this—and you'll be asked often—click yes.

GET USED TO THOSE ERRORS

AT THIS POINT, you'll see a dialog box that reads, 'A file being copied is older than the file currently on your computer. It is recommended that you keep your existing file.' Select *No to All.*

The fun really begins when you boot into Windows 95. You'll get a passel of error messages, most complaining about files that can't be found or launched. The first prompts will flash by too quickly to read, but eventually you'll see a series of 'Cannot find a device file' messages, each offering half a screen of explanatory text and a 'Press any key' prompt. Write down the file names before continuing. After your PC switches from text to graphics mode, you'll get additional error messages. Again, write down the names of the files and the programs that are causing problems.



To fix the first set of errors, you must edit msdos.sys. Select *Start•Shut Down•Restart* in MS-DOS Mode, and type the following commands, in sequence, at the prompt:

```
attrib -r -h -s \msdos.sys
start /w notepad c:\msdos.sys
attrib +r +h +s \msdos.sys
```

You can open msdos.sys manually by doing the following:

1. Open *My Computer* and select *View•Options.* On the View tab, select *Show all files,* then click *OK.*
2. Right-click *msdos.sys* and select *Properties.* Uncheck *Read-only,* then click *OK.*
3. Select *Start•Run.* Enter the command **notepad c:\msdos.sys** and press **<Enter>**.

No matter how you open msdos.sys, go to the end of the file and delete the lines that follow the large block of Xs—these are Windows 98–specific commands that confound Windows 95. Exit Notepad and save the file. Now turn the read-only option on msdos.sys back on. Reboot, and make sure that the first set of errors—the group that flashed by too fast for you to read—isn't there anymore.

FIND THE CAUSE

YOU'LL HAVE TO FIX the other errors one at a time. Repeat these steps for each error message to eliminate its cause:

1. Select *Start•Run,* enter the command **regedit**, and press **<Enter>**.
2. Press **<Ctrl>-F**. In the 'Find what' field, enter the file name from the error message—without the extension. For instance, if the error is 'Cannot find file ntkern.vxd', enter **ntkern**. Press **<Enter>**.
3. When the search stops, delete the highlighted key or value (a *key* is an entry in the left pane that looks like a folder, and a *value* is found in the right pane and looks like a tiny page). Confirm the deletion, then press **<F3>** to find the next occurrence of the name. Repeat the process until the file is no longer mentioned.
4. When you've removed all mentions of the file, close RegEdit and reboot. That particular error message should no longer appear. If the error persists, you may need to repeat the previous step, because some stray references to that driver may have eluded you during the first attempt.

Further tweaking may be needed. For instance, when I tested this tip, I had to reinstall the driver for my Matrox Mys-

Convert BMPs to Icons

YOU CAN TURN ANY .bmp file into an icon simply by changing its extension to .ico. Click the bitmap file you want to change, select *File•Rename,* and then replace the .bmp extension with .ico. Press **<Enter>**, and Windows will immediately replace the application icon with a tiny version of the image. Keep in mind that the icon image may look small, but Windows must still deal with the contents of the .bmp file. System performance will suffer if Windows must redraw dozens of these images.

ILLUSTRATIONS: JEFFREY PELO (TOP); DOUG ROSS (BOTTOM)

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GetRight

$18 registration fee, HeadLight Software, www.getright.com

tique video card. Again, no promises, but this recourse is your best hope for restoring Windows 95.

TOO GOOD TO BE TRUE?

I USE A SECOND hard drive to back up my primary one. Since hard disks are so inexpensive, I wonder why this method isn't more prevalent. Is there an inherent weakness in my solution?

Michael Averill, Val-David, Quebec

BACKING UP A HARD DRIVE to a second hard drive is easy and fast, but not carefree. You can't easily separate an internal hard drive from your computer, the way you can separate tape or other removable media. That means your backed-up data is not protected against power surges, fire, or theft.

WATTS YOUR COMPUTER USING?

HOW MUCH ELECTRICITY does a PC use? My college-student daughter never turns off her PC and monitor, and her roommates are concerned that she's adding too much to the electric bill. I suspect that their hair dryers use more power than the PC. Is there a way to calculate this usage and its cost?

Gene Burch, Temecula, California

SURE, MINUTE FOR MINUTE, a computer and a monitor use a lot less electricity than a hair dryer, but I sincerely doubt that these students keep their hair dryers humming "24/7."

How much power a computer consumes depends on its processor, components, and design and the amount of time it is actively in use. Not uncommonly, a computer designed to handle 200 watts (exclusive of the monitor) draws about 100 watts when in use and 50 when idle.

The real power hog is the monitor. A 17-inch monitor that's left on all the time can easily use 160 watts; even a 14-inch model can consume 100. Do the math: At an average cost of 12 cents per kilowatt hour, a 17-inch monitor that never goes to sleep will cost over $150 a year to operate. See **FIGURE 1** for details on other peripherals and their juice consumption.

If your daughter must keep her PC on, she should use its power-saving features. Unless her monitor is more than three or four years old, it is almost certainly Energy Star compliant. She can set the power saving options by right-clicking the desktop, selecting *Properties*, and clicking the *Screen Saver* tab. She'll get options at the bottom of the window to send the monitor to standby mode—where it uses about 20 percent of full power—or to shut it off almost entirely during idle usage.

Your daughter is less likely to have a computer that goes into power-saving mode. Tell her to run the following sequence: From the Windows desktop select *Start•Help*, click the *Index* tab, and type **power**. Double-click *Suspend command, showing or hiding*. In the resulting Help window, click the arrow icon. She'll get either a pop-up box saying that her computer doesn't support power management or a dialog box of options. But today's computers aren't all that energy efficient; most of them still gobble up about 30 watts even when powered down.

Find more tips at www.pcworld.com/heres_how. Find files mentioned in this article at www.fileworld.com/magazine. We welcome questions and tips and pay $50 for published items. Humor columnist Lincoln Spector is a PC World *contributing editor. See page 14 for contact information.* ■

Download Lots of Files

IF YOU USE A modem, downloading lots of files off the Web is a pain. With each file you start downloading, surfing speed diminishes; and if you have six or seven files to download, Web browsing comes to a screeching halt. HeadLight Software's GetRight manages downloads and makes them easy. Just click a file in your browser, and GetRight puts it in its database (see **FIGURE 2**). It will automatically dial in to your Internet service provider and download the files while you do something that doesn't require bandwidth—like sleep. As a bonus, this utility will also resume failed downloads so you don't need to wait another hour for that 20MB file to download. GetRight is available on FileWorld.

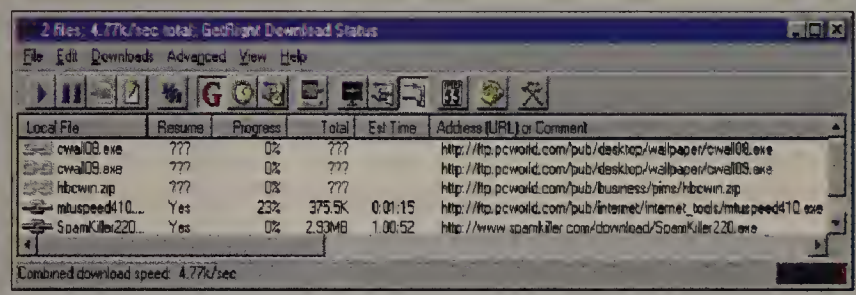

FIGURE 2: GETRIGHT LETS YOU schedule overnight file downloads and resumes partial (failed) downloads so you don't have to start over.

IT PAYS TO POWER DOWN MONITORS

COMPONENT	Full use (watts)	Idle (watts)	Power-saving mode	Annual cost [2]		
				Always on	With power-saving mode	On during work hours only
System unit	80-200	36-70	28-30	$48-$105	$42-$72	$19-$48
14-inch monitor	80-100	n/a	5-8 [1]	$84-$105	$23-$30	$19-$24
17-inch monitor	100-160	n/a	1-8 [1]	$168-$168	$39-$45	$38-$38
Laser printer	120-170	n/a	5-7	n/a	$33-$46	$29-$41
Ink jet printer	12-30	n/a	1-5	n/a	$4-$11	$3-$7

[1] Monitors usually have two modes to save power: standby and sleep. The numbers listed here are for the sleep mode.
[2] Based on 12 cents per kilowatt hour. Assumes 50 40-hour work weeks a year.

FIGURE 1: MONITORS AND LASER PRINTERS are two big consumers of electricity. Fortunately, both of these high-demand components now sport significant power-saving features.

Protect your privacy ◆ Learn to read e-mail headers ◆ Make your e-mail sing

Teach Your Old Browser New Navigation Tricks

WHEN YOU CLICK Internet Explorer's Search button, the browser brings up a special search menu in its Explorer Bar—a pane to the left of the browser. What makes using this search bar better than heading to the search site itself? All the search results display in the left pane, so you don't have to keep clicking the Back button to return to the search site. You can toggle the search frame on and off by clicking the Search button.

If you're using Internet Explorer 4, you can configure your browser to rely on almost any search engine. Set this preference on home.microsoft.com/search/lobby/searchsetup.htm. IE 5 makes things easier still, by combining several search engines into a one-stop search tool. With IE 5, the key to effective searching is the Next button in the search bar, which lets you scroll through results from all participating search engines.

Alternatively, you can find what you're looking for by typing a keyword into IE's address bar. Internet Explorer treats any two or more words, separated by spaces, as a search query and directs these to a special area on Yahoo devoted to IE searches. If the expression you're looking for consists of a single word, precede it with a question mark followed by a space, or with the word **find** or **go** followed by a space.

Navigator's Search button takes you to a search page on Netscape's Web site where you can search with Netscape's own search tool or with AltaVista, Excite, Infoseek, LookSmart, or Lycos. But unlike IE 5, Navigator doesn't pass your query to all these engines simultaneously. Navigator 4.06 and later offer Smart Browsing features that make Web searching equally convenient. When you type keywords (such as **flyfishing gear**) into Navigator's location bar, the browser takes you to Netscape's site and returns a few related URLs. Precede any single-word keyword with a question mark, or Navigator will try to add "www" and "com" to it. You can also drag and drop a phrase from another application (say, a word processor) into the browser window, and Navigator will jump you to a site of the same domain name or will search for that phrase on the Web.

Still can't find what you're looking for? Click the *What's Related* button, and you'll get a list of URLs that are related to the current Web site. If you like this feature, but your current browser (IE or older versions of Navigator) doesn't support it, download the add-on Alexa from PC World Online's FileWorld. Alexa adds a small pane to the bottom of your browser, where it displays related links.

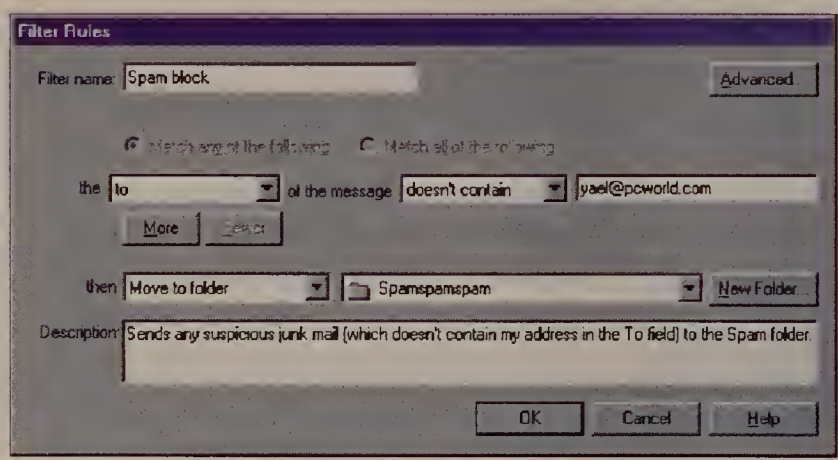

FIGURE 1: TELL NETSCAPE MESSENGER to discard or file away any incoming message that isn't intended for you personally.

Rewrite Your History

WANT TO PURGE your PC of all signs that you spent your lunch hour playing bridge with two 16-year-olds from Instanbul? Use SwanSoft's $15 HistoryKill to erase all the stored URLs in your browser, including those in the History box. You can configure this shareware tool to remove URLs on command or during boot-up. It also removes cache files, cookies, and the Recent document list. It works with IE and Navigator. Get it from www.swanksoft.com/historykill or from www.fileworld.com/magazine.

HOME-MADE SPAM FILTER

HERE'S A GREAT way to filter out junk e-mail, suggested by Anthony Ferrer via the Internet. Since most spammers send their messages to mailing lists, just set your mail client to reject any message not intended for you personally. In Messenger 4.*x*, press **<Ctrl>-<Shift>-1** to go to Message Center, and select *Edit•Message Filters*. Name the filter, and then click the down arrow next to all fields in the next line (see **FIGURE 1**) to create an expression that reads "the TO of the message doesn't contain *address@server*.com."

In Eudora (version 3 or higher), select *Tools•Filters* and click next to *Incoming*. Under Header, select *To*. Then, in the next line, select *Doesn't Contain*, and type your e-mail address. Under *Action*, select *Transfer*. Click the box to the right of that field and select the mailbox where you want junk mail to be deposited while it awaits future perusal (or deletion).

Outlook Express lacks an option for creating this filter.

ANATOMY OF AN E-MAIL HEADER

WHETHER YOU SEE it or not, every e-mail message you get comes with a digital "paper trail" known as the e-mail header. Some mail administrators (such as your Internet service provider or your IS manager) may trim these before they reach you, but you see them when others forward you mail. E-mail headers tell you where the message came from, what machines it traveled through in its jour-

ILLUSTRATION: JEFFREY PELO

ney from the sender's mail server to your own. This information is usually discarded and ignored, but you should look for it when you want to track down the source of an insistent spammer.

To view a message's header in Netscape Messenger, select *View•Headers•All*. In Outlook Express, open the message, select *File•Properties*, and click the *Details* tab. In Eudora simply press the button labeled *Blah Blah* at the top of the message.

Reading message headers is an art, because sophisticated spammers can forge certain elements to obscure their trail. The image in the center of the page shows an example of a message header sent by a spammer whose e-mail address is supposedly snodgrass@ditznet.com.

SET YOUR E-MAIL TO MUSIC

HERE ARE TIPS for setting your e-mail program to play songs, roll drums, or pipe bucolic bleats when important mail comes your way.

AOL Tired of those irksome tunes AOL plays whenever "You've got mail" or a file has finished downloading? Kenny S. Lee of Diamond Bar, California, writes that AOLians can change the music by replacing any of the six sound files in AOL's main directory—drop.wav, welcome.wav, filedone.wav, goodbye.wav, gotmail.wav, im.wav—with other .wav files. (We'd recommend harp music.) Copy your preferred .wav file to the AOL main directory, and rename it with the file name of the AOL tune you're replacing. Or silence AOL's completely by erasing those files.

Eudora To have Eudora Pro play a tune to herald e-mail from a specific person, create a filter. Select *Tools•Filters*, and check *Incoming*. After Header:, select *From:*. After Contains, enter the sender's e-mail address. Under Action, select *Play Sound*.

To configure Eudora Pro or Lite to play a favorite tune when mail arrives, select *Options* from the Tools menu. Under Category:, scroll to and click the *Getting Attention* icon. Place a check beside *Play a Sound*, and click the blank bar beneath it. In the Select a Sound File box that appears, browse to your preferred .wav file. Select it and click *Open*. Click *OK*.

Outlook Express Head to Windows' Control Panel (*Start•Settings•Control Panel*). Open the *Sounds* icon. In the Sounds tab, under Events:, scroll to New Mail Notification. Browse to the .wav file you wish to play. Select it and click *Apply*. Next, in OE, select *Tools•Options*. In the General tab, place a check beside *Play sound when new messages arrive*. Click *OK*.

Netscape Messenger To set Messenger to play a sound when new messages arrive, select *Start•Programs•Netscape Communicator•Utilities•Netscape Mail Notification*. A mail icon will appear in your system tray. Right-click it and select *Options*. Choose *Play This Sound File*, and click *Browse*. Find the .wav file you'd like Messenger to play, and click *Open*. You must also configure Messenger to play sounds. From the Edit menu, select *Preferences*. Head to Mail & Groups, and check *Enable sound alert when messages arrive*. Click *OK*.

Find files from this article at www.fileworld.com/magazine. Contributing Editor Judy Heim is a coauthor of The Quilter's Computer Companion *(No Starch Press, 1997). See page 14 for contact information.* ■

Anatomy of an E-Mail Header

```
❶ From: snodgrass@ditznet.com

❷ Received: from little.mx.frogholenet.com (little.mx.frogholenet.com
  [169.207.1.102])
      by big.mx.frogholenet.com (8.8.8) with ESMTP id DAA12539
      for <bob@frogholenet.com>; Mon, 4 Jan 1999 03:46:03 +0000 (CDT)

❸ Return-Path: <snodgrass@ditznet.com>

❹ Received: from bigdope.gomer.net (root@gomer.net [000.67.176.22])
      by big.mx.frognet.com (8.8.8) with ESMTP id DAA14592
      for <bob@frogholenet.com>; Mon, 4 Jan 1999 03:47:18 +000 (CDT)

❺ Message-ID: <34111AF1.34FF@gomer.net>
  Date: Mon, 04 Jan 1999 01:57:21

❻ Reply-To: poorchump@mci.net

❼ To: undisclosed-recipients:;
  Subject: Act Now! Or It Will Be Too Late!
```

❶ This line identifies the message's supposed author, but anyone can fabricate the "From" information in most Internet mail programs.

❷ This section records the path the message took through the network of computers at Bob's ISP FrogHoleNet.Com. The mail server named "Big" received the message and sent it to the mail server named "Little"; then Little sent it to Bob's mailbox. At 3:46 a.m. Greenwich Mean Time (which is 7:46 p.m. PST of the previous day), FrogHoleNet.Com received the message. The ESMTP ID is the message's identification number on the originating mail server.

❸ Don't trust the accuracy of the Return-Path data. This bit of information is easy to forge—and spammers know it.

❹ Another detour: FrogHoleNet.Com's mail server Big received the message, not from a DitzNet computer, but from a computer called Bigdope at an ISP called Gomer.Net. If we had blithely proceeded to send a message of complaint to the mail master at DitzNet (postmaster@ditznet.com), as popular wisdom recommends, it would have gone to an ISP that probably had nothing to do with the spammer or the spam. The trick is to focus instead on the numbers that follow a computer's address (in this particular example, 000.67.176.22); these numbers make up the computer's DNS (domain name server) address, which identifies it to the rest of the Internet. Forward this information to your ISP and request that it block all future messages from that server.

❺ The originating mail server assigned this ID number to the e-mail message. This is a final, important clue in ascertaining where a spam originated. Though spammers can forge the From, Return-Path, and Reply-To fields, they can't counterfeit message IDs. Together with the information in the Received field, the data in this line proves conclusively that the message originated at Gomer.Net.

❻ This nasty spammer has set up his or her mailing so that any angry replies will get redirected to some poor schlub at MCI.Net. That's why, when you receive a spam, you should refrain from hitting the reply button immediately to dash off a note of outrage.

❼ The anonymous To field is the spammer's best friend. It won't help you at all.

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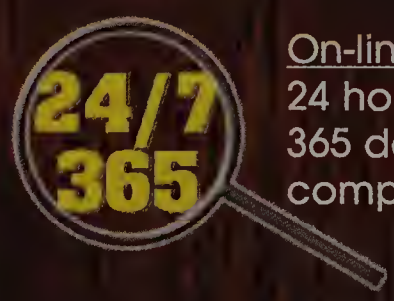

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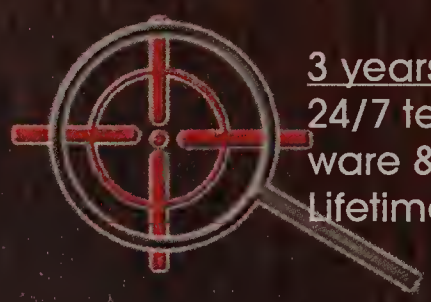

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Replace symbols ◆ Streamline toolbars ◆ Customize Letter Wizard

Create Instant Graphics Shortcuts in Word

WANT TO INSERT an oft-used image into your documents without futzing with menus and dialog boxes? There's an easy way to do it in Word 6.0 and later:

1. Open a new document in Word and select *Insert•Picture*. In the resulting dialog box, choose the image you plan to use frequently. (In Word 97, you must select the image's type from a submenu before you'll see a list of images.) Click *OK* or *Insert* to insert the image into the blank document.
2. Click the picture in the document to select it.
3. In Word 6 and Word 95, select *Edit•AutoText*. In the AutoText dialog box, you'll see a preview of the graphic (see **FIGURE 1**). Type an abbreviation, such as **logo1**, in the Name box, and then click *Add*.

In Word 97, select *Insert•Autotext•New*. Type an abbreviation, such as **logo1**, in the Create AutoText dialog box, and click *OK*.

4. To insert the image in another document at any time, type the abbreviation you selected and then press **<F3>**. The image will appear at the cursor location.

PICK YOUR DEFAULT TEMPLATE

USERS WHO NEED to work from a specific template in Word (other than the default one) often use the File•New command right after launching Word to start a new document and pick a template. But if you almost always use a particular template, why not make it the default and save yourself a few keystrokes? Here's how to substitute another template for the default normal.dot template:

1. Exit all open copies of Word.
2. Use File Manager (in Windows 3.1) or Explorer (in Windows 9*x*) to find the version of normal.dot that goes with your version of Word. Can't locate it? Select *Tools•Find•Files or Folders* or use File Manager's *File•Search* command, and search for normal.dot.

3. Select *normal.dot* from the choices in the file list; then select *File•Rename* and type **default.dot**. Next, press **<Enter>**. In Explorer, right-click the file and select *Rename*. This step will preserve the original file in case of a mishap.
4. Locate and select the file you want to use as the new default template.
5. Select *File•Rename* and type **normal.dot.**

From now on, Word will automatically load the new normal.dot template at launch. Whenever you want to use the plain old template, simply select *File•New* and choose the *default.dot* template that you created earlier.

If you run Word in a networked environment, consult your IS department before making any changes.

SIMPLIFY WORD 97'S INTERFACE

IF YOU'RE LIKE MOST people, there are many Word 97 menu commands and toolbar options you never use. Wouldn't it be convenient if you could strip down Word's baroque interface to suit *your* needs and dump the dross? You can.

1. Exit all open copies of Word.
2. Using *Start•Find*, locate normal.dot on your hard disk.
3. Select *normal.dot* and then select *File•Rename*. Type **default.dot** and press **<Enter>**. Doing this preserves the original normal.dot file so you can revert to the full interface later if you wish.
4. Start Word 97. If you've renamed normal.dot, the program will create a fresh version with all its factory defaults.
5. Select *Tools•Customize*. Click the *Toolbars* tab (see **FIGURE 2**).
6. Get rid of any unwanted toolbars by removing the check mark from the box to the left of those toolbar names. Mark any toolbars you want visible by clicking the box to the left of those toolbar names so that a check mark appears there.
7. Click the *Commands* tab in the Customize dialog box; then click any icons you *never* use, drag them to the document

A Quick Format Undo in Word

IF YOU'VE CREATED a large block of text that includes boldface, italics, or underlines, you can eliminate all the special formatting in one quick pass. First, make the entire selected text assume that formatting: Select the block of text, and click the appropriate toolbar buttons for boldfacing, italicizing, or underlining. Then click those same toolbar buttons again to remove the formatting.

To remove *all* formatting from your text and revert to the default style, select the text and press **<Ctrl>-<Shift>-Z.**

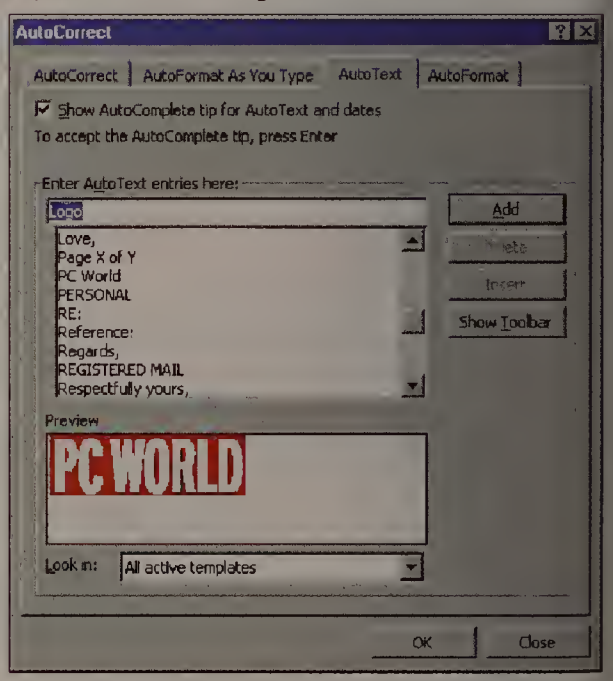


FIGURE 1: HANDY MISNOMER: Word's AutoText lets you create shortcuts to embed images.

ILLUSTRATIONS: JEFFREY PELO (TOP); DOUG ROSS (BOTTOM)

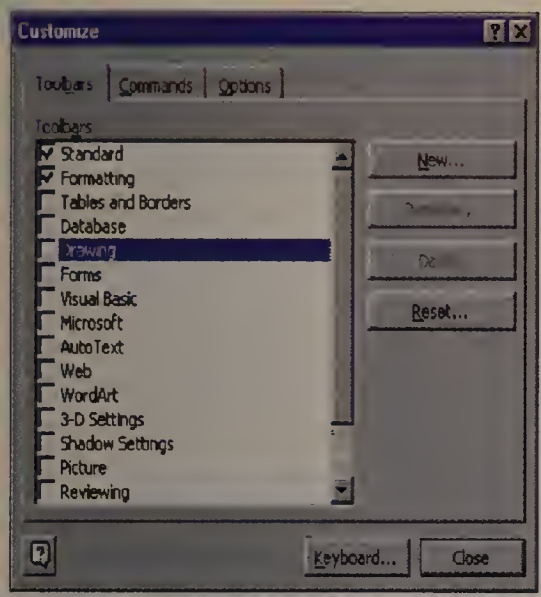


FIGURE 2: THE CUSTOMIZE dialog box helps you configure your toolbars and menus.

window, and drop them there. Not sure of an icon's function? Right-click it and read its name in the context menu.

8. Keep the Customize dialog box open as you click each main menu command and examine the submenu commands that appear. If you find a command you *never* use, click and drag it to the document screen. A triangle will appear to the right of menu commands that have submenus. Remove individual submenu items by clicking them and dragging them down, off the toolbar or menu.

9. To activate your changes, click *Close* in the Customize dialog box. **Note**: Any time before you close the Customize dialog box, you can click *Reset* to undo all the changes you've made up to that point. But once you close the dialog box, you can't undo the changes from within Word.

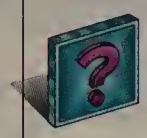
10. If you wish, you can change other default settings from the Options dialog box (select *Tools•Options*) and in the View menu's Toolbar item.

11. Exit Word. The next time you run it, you'll see your changes implemented as the new default interface. Your formerly complex program is now tamed and customized to suit your precise needs.

This tip also works well if you want to hide tricky or treacherous features from innocent novices or subordinates in the office. If you need to regain the full Word interface temporarily, select *File•New*; then select the *default.dot* template you created in step 3, and click *OK*. To return to Word's defaults permanently, exit Word, delete normal.dot, and rename default.dot back to **normal.dot**.

Hint: If you foul up Word's interface irreparably or if you inherit a PC with a scrambled Word interface, and you need to reinstate Word's original default settings, simply delete normal.dot when Word isn't running. The next time you run Word, the program will create a new template that uses the Word default settings. All versions of Word can do this.

REMOVE ITEMS FROM LETTER WIZARD LISTS



I RECENTLY WROTE a business letter in Word 97, using the Letter Wizard for the first time. Under the Other Elements tab, I checked the References Line box and typed in my reference number. Now that number permanently appears in the Reference Line pull-down menu. How can I delete this number?

Sheldon Friederich, Zellwood, Florida

THIS IS A FLAW in Letter Wizard. If you type new text in any of the lists that appear under the Other Elements tab, your addition becomes a permanent part of the wizard. Fortunately, you can easily clear unintended entries, which, oddly enough, Word stores as AutoText. To remove an entry, select *Tools•AutoCorrect*, and click the *AutoText* tab (see **FIGURE 3**). Scroll down the list of AutoText entries until you find the item you unwittingly inserted into the Letter Wizard. Select it, click *Delete*, and then choose *OK*. It'll be gone the next time you use the Letter Wizard.

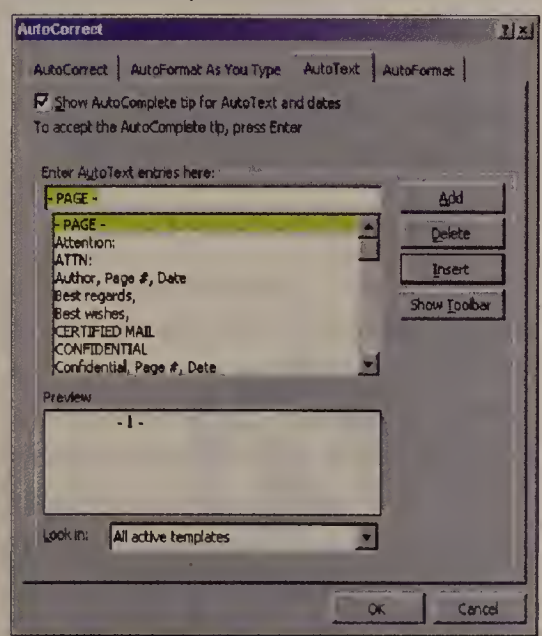


FIGURE 3: THE LETTER WIZARD in Word 97 is simply a collection of AutoText entries.

REPLACE SYMBOLS IN WORDPERFECT 6.1 AND LATER

YOU PROBABLY ALREADY know that WordPerfect permits you to use the Insert•Symbol command to "type" special characters (smiley faces, pointing hands, and so on) into documents. But what if you want to replace a symbol with another throughout a document?

Here's a simple way to avoid unnecessary manual input. You can also use this method to replace international characters—say, if you want to replace rèsumè with résumé (see **FIGURE 4**).

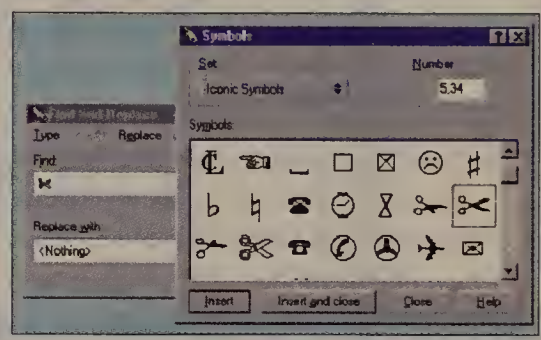


FIGURE 4: REPLACE SYMBOLS or international characters just as you would any text.

1. In a document, select the symbol or character you want to change. Select *Edit•Find and Replace*.

2. When the Find and Replace dialog box opens, the selected character will appear in the Find field. Press **<Tab>**.

3. Press **<Ctrl>-W** to open the Symbols or WordPerfect Characters dialog box. Select a different character, and then select *Insert and Close*. This sequence inserts the replacement character in the 'Replace with' field.

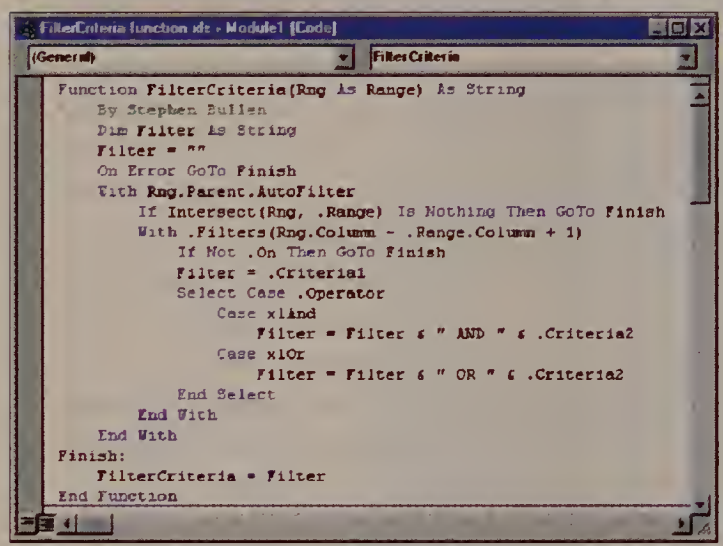
4. Select *Replace* or *Replace All*, and you've finished the job.

Hint: You can use the same technique to insert special characters in any WordPerfect dialog box. For example, when you're working in WordPerfect's Styles Editor or QuickCorrect dialog box, just press **<Ctrl>-W**, and you'll get access to the entire set of symbols and characters available in WordPerfect.

Word Processing *welcomes your questions and tips and pays $50 for published items.* PC World *Contributing Editor George Campbell is a contributor to* The PC Bible *(Peachpit Press, 1995). See page 14 for contact information.* ■

Display AutoFilter Criteria in Excel

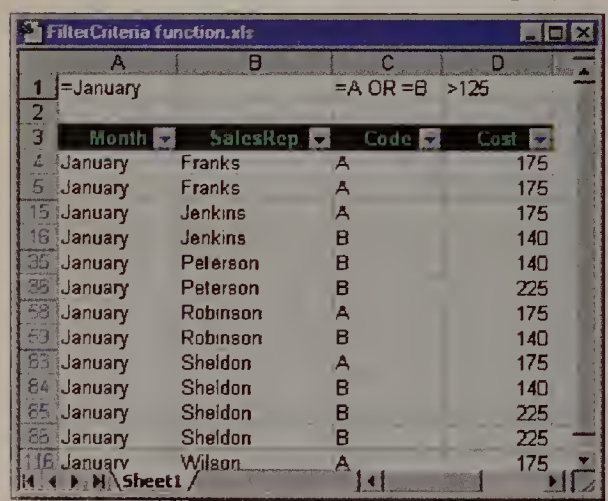
EXCEL'S AUTOFILTER feature, which you access by selecting *Data•Filter•AutoFilter*, gives you a fast and easy way to view rows that meet certain criteria. It works with a range of cells set up as a database. When AutoFilter is turned on, the row headers display drop-down arrows that let you specify criteria (such as "Age greater than 30"). Rows that don't meet your criteria are hidden—but are redisplayed when you turn off AutoFilter.



```
Function FilterCriteria(Rng As Range) As String
    By Stephen Bullen
    Dim Filter As String
    Filter = ""
    On Error GoTo Finish
    With Rng.Parent.AutoFilter
        If Intersect(Rng, .Range) Is Nothing Then GoTo Finish
        With .Filters(Rng.Column - .Range.Column + 1)
            If Not .On Then GoTo Finish
            Filter = .Criteria1
            Select Case .Operator
                Case xlAnd
                    Filter = Filter & " AND " & .Criteria2
                Case xlOr
                    Filter = Filter & " OR " & .Criteria2
            End Select
        End With
    End With
Finish:
    FilterCriteria = Filter
End Function
```

FIGURE 1: THIS IS THE VBA code for the FilterCriteria function. Use the function to display AutoFilter criteria.

One problem is that Excel doesn't tell you which criteria are in effect. To overcome this deficiency, Stephen Bullen, a UK-based Excel guru, sent me a custom VBA worksheet function that displays a cell's AutoFilter criteria (see **FIGURE 1**).



	A	B	C	D
1	=January		=A OR =B	>125
2				
3	Month	SalesRep	Code	Cost
4	January	Franks	A	175
5	January	Franks	A	175
15	January	Jenkins	A	175
16	January	Jenkins	B	140
36	January	Peterson	B	140
38	January	Peterson	B	225
58	January	Robinson	A	175
59	January	Robinson	B	140
83	January	Sheldon	A	175
84	January	Sheldon	B	140
85	January	Sheldon	B	225
86	January	Sheldon	B	225
116	January	Wilson	A	175

FIGURE 2: FILTERCRITERIA displays the AutoFilter criteria currently in use (see row 1).

To create this function in Excel 97 or later, press **<Alt>-<F11>** to insert a new module for the active workbook. Then enter the code shown in Figure 1. In Excel 5 or 95, select *Insert•Module* and enter the code in the new module sheet. Once you've entered the code, you can type in a formula such as **=FilterCriteria(A3)**. The single-cell argument for the FilterCriteria (in this example, A3) can refer to any cell within the column of interest. The formula will return the current AutoFilter criteria (if any) for the column of the cell specified in the FilterCriteria function.

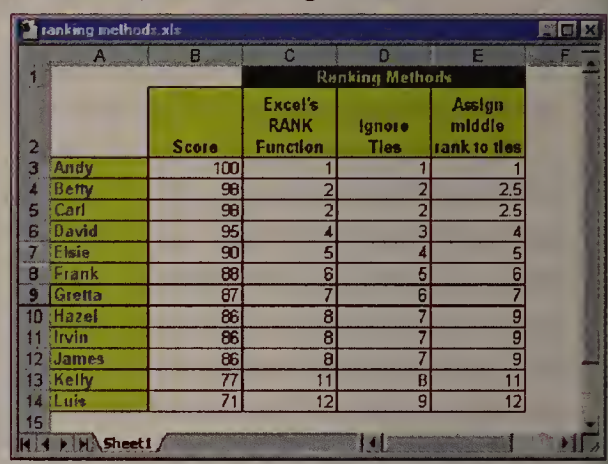
FIGURE 2 shows the FilterCriteria function in action. The cells in row 1 contain formulas that use FilterCriteria. As you can see, the list is currently filtered to display a table in which column A contains the word *January*, column C contains a code of either *A* or *B*, and column D contains a value greater than 125 (column B is not filtered). The rows that don't match these three criteria are hidden.

RANKING DATA IN EXCEL

EXCEL'S RANK() function returns the ranking of a particular number in a list of numbers. For example, you can use this function to generate a performance ranking of your sales staff or of your students on a test. The Rank() function is certainly useful, but when it yields a tie, the result may not be what you had in mind.

FIGURE 3 shows three different ways to rank ties. Use the method most suitable for your needs. Column C displays the rankings produced by the Rank() function, column D shows an alternative ranking method in which ties are ignored, and column E shows a method that assigns each tie value the middle rank.

There's no easy way to generate the rankings shown in Columns D and E. But I've developed a custom worksheet function called AltRank() that gives you extra flexibility for handling ties.



	A	B	C	D	E
1			Ranking Methods		
2		Score	Excel's RANK Function	Ignore Ties	Assign middle rank to ties
3	Andy	100	1	1	1
4	Betty	98	2	2	2.5
5	Carl	98	2	2	2.5
6	David	95	4	3	4
7	Elsie	90	5	4	5
8	Frank	88	6	5	6
9	Gretta	87	7	6	7
10	Hazel	86	8	7	9
11	Irvin	86	8	7	9
12	James	86	8	7	9
13	Kelly	77	11	8	11
14	Luis	71	12	9	12
15					

FIGURE 3: COLUMNS C through E show three different ways to rank the data in column B.

My AltRank() function is too lengthy to list or describe here, but if you download Ranking.zip from PC World Online's FileWorld (www.fileworld.com/magazine), you'll get an Excel workbook with this function and instructions for using it.

Find files from this article at www.fileworld.com/magazine. Spreadsheets welcomes questions and tips and pays $50 for published items. Contributing Editor John Walkenbach is the author of nearly two dozen books. Visit him on The Spreadsheet Page (www.j-walk.com) or see page 14 for contact information. ■

Alternate-Row Shading

ONE WAY TO MAKE your data legible is to apply cell shading to every other row in a range. In Excel 97 or later, select the range and choose *Format•Conditional Formatting*. In the Conditional Formatting dialog box, select *Formula Is* from the drop-down list, and enter this formula: **=MOD(ROW(),2)=0**. Click *Format*, select the *Patterns* tab, and specify a color for the shaded rows. Click *OK* twice and you're done! You'll find that the row shading persists even if you insert or delete rows within the original range.

ILLUSTRATION: JEFFREY PELO

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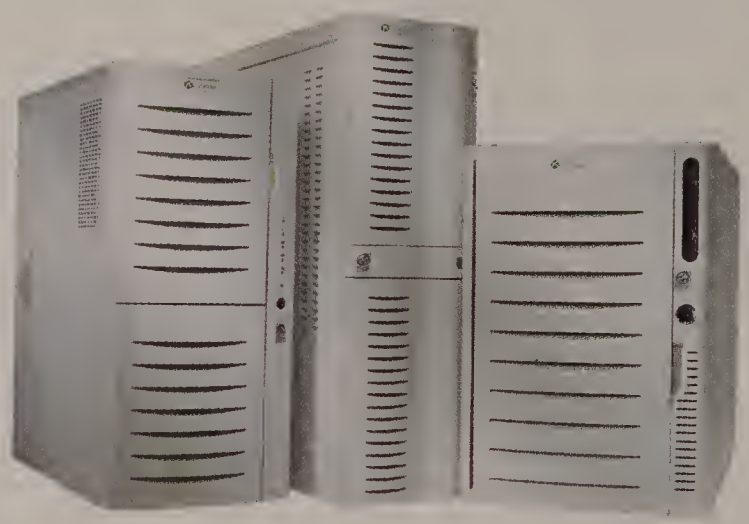

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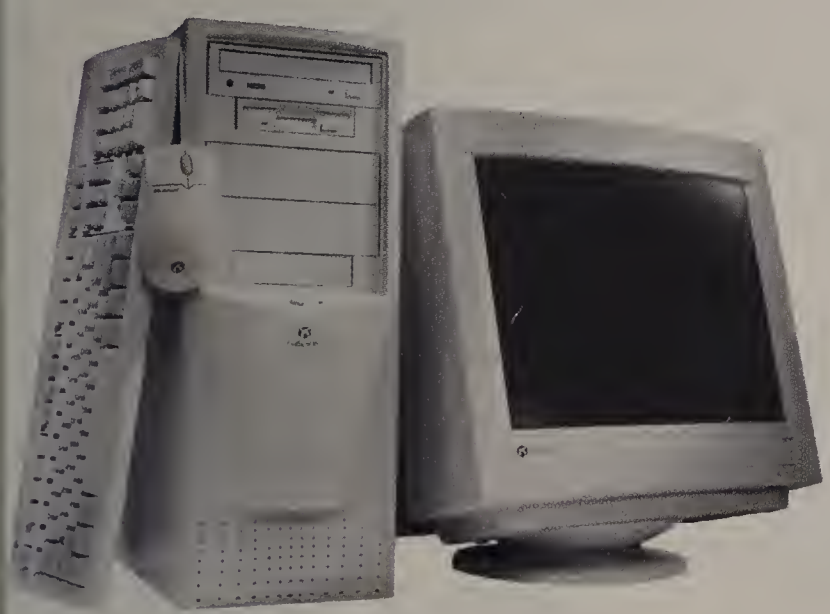

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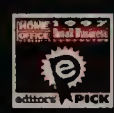

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Reset Your Forgotten System Password

FACE IT: COMPARED to Windows 9*x*'s security features, the fold-lock top of a cereal box is impenetrable. Almost anyone can get past your log-on password just by hitting **<Ctrl>-<Alt>-<Delete>** to restart the PC and boot into DOS. Once there, a hacker can delete the PWL files in your Windows directory to disable password protection. For tighter security, you must rely on the CMOS password, which comes into play before Windows loads. CMOS (an acronym standing for *complementary metal oxide semiconductor*) is part of the firmware on your motherboard that holds your BIOS code and settings. Once you have enabled the password option in your CMOS setup program, your system will prompt you for the password at boot-up, *before* it gets to the operating system.

Because there are many different BIOS versions, I can't give you specific instructions. In general, you need to enter your PC's CMOS setup program by hitting the appropriate key at the beginning of your boot process. A screen prompt usually lets you know which key to press—often it's <Delete> or <F1>. When the CMOS setup screen appears, scan the menu choices for User Password or a similar entry (see **FIGURE 1**). When prompted, type in your password of choice. And be *very* careful not to mistype. Even if you're an excellent touch-typist, it won't hurt to look at the keyboard this time when you type the password. Warning: If you lose or forget this password, you won't be able to use your PC.

Okay, so what if you *do* forget or mistype your password? Unfortunately, there's no quick workaround, but the first step is to try to find another password that works. Default passwords—also known as *backdoors*—can be added by the manufacturer of the BIOS, motherboard, or PC. In some cases, when you initially set up your password, the CMOS setup program may ignore what you have typed and instead activate a default password. In that event, call your PC manufacturer—or if need be, the makers of your motherboard and BIOS—and ask whether a default password exists. Also try these words: **AMI**, **AWARD SW**, **password**, and **cmos**. These passwords are often case sensitive, so you might try using all-capital and all-lowercase variants.

Failing that, many systems permit you to physically reset the CMOS contents from the motherboard. Check your computer's or your motherboard's manual for a jumper that can clear the current CMOS password. If the jumper is there, you can just set it and be back in business.

If your system lacks a password reset, you can still hack your way in by using a motherboard jumper to reset the entire contents of the CMOS program. Of course, this wipes out vital system information, including hard disk settings, power settings, and time and date. So write down your hard disk configuration and other key CMOS settings before refreshing the CMOS. Though most CMOS programs auto-detect the hard disk configuration, it won't hurt to have this information handy.

No reset jumper? You can erase the BIOS settings by removing the CMOS battery from the motherboard. The battery is typically a round, metallic unit that rests on the motherboard near the power connector; check your manual to make sure. If the battery is removable, pull it out and keep it out for several hours: It may take a while for the charge to drain out of the CMOS circuitry.

In many motherboards the CMOS battery is soldered down, but don't let that discourage you. If your motherboard has a connector for adding a second battery, you can set a jumper to disable the old battery, wait several hours for the CMOS to drain, and then connect the new battery. If no such connector is present, you'll have to take your PC into the shop to get the

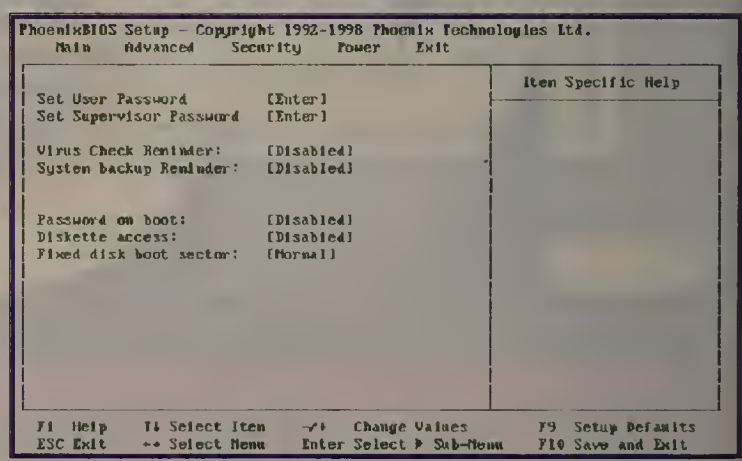


FIGURE 1: THE TEXT-BASED BIOS SETUP (in this example, it's by Phoenix), lets you set a password for ironclad security.

Why Won't My CD Play?

HAVING TROUBLE getting audio CDs to play over your PC's speakers? When you play CDs on a CD-ROM drive, the signals bypass the digital pathways of your PC and travel directly from the CD-ROM drive to the sound card via a small wire and then out to the speakers. This wire can come loose, so make sure it's securely connected. Most CD-ROM drives include a headphone jack and volume knob. Even if your system doesn't have an audio patch wire installed, you can plug your headphones into the drive and listen away.

ILLUSTRATIONS: JEFFREY PELO (TOP), DOUG ROSS (BOTTOM)

CMOS battery replaced. Don't forget to tell the technician to let the CMOS settings clear before replacing the battery.

HARD DISK DILEMMA

MY SYSTEM HAS been in the same spot on my desk since I bought it new a year ago. But yesterday I ran ScanDisk as part of my weekly maintenance and found a bunch of errors. Do I have bad sectors? How did this happen? Is it old age?

Nancy Bronto, El Paso, Texas

BAD SECTORS CAN be an indication that your hard disk is starting to break down, but that seems improbable here. A year-old hard disk usually isn't a candidate for the scrap heap. More likely, you're looking at residue left behind by Windows.

Windows 95 and Windows 98 maintain frequently used files in quickly accessible RAM rather than on the slower hard disk. That boosts performance, but it also means that key system files aren't safely ensconced on the disk when your system shuts down prematurely—after an application crash or a power outage, say. Because Windows doesn't have a chance to write those cached files back to disk, you can end up with orphaned file fragments, lost clusters, and other nuisances. The bad sectors ScanDisk encountered may be the result of unexpected shutdowns.

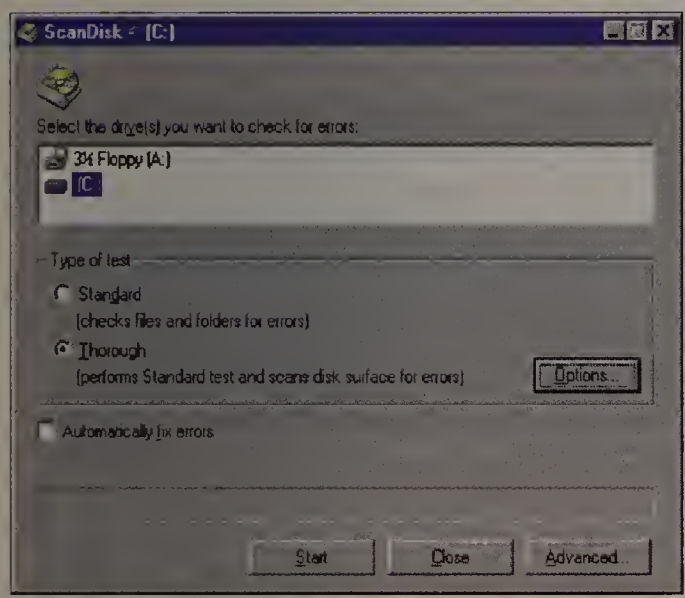


FIGURE 2: SELECT SCANDISK'S THOROUGH option to test the physical integrity of the hard disk's surface.

Windows 95 OSR2 and Windows 98 address this problem by running ScanDisk when the PC boots up following a crash. But all Windows users should also run ScanDisk on their own periodically to monitor the health of their hard disk data. To launch ScanDisk, click *Start•Programs•Accessories•System Tools•ScanDisk*. The program examines your hard disk's file structure and tests the physical surface of the disk for damaged sectors.

ScanDisk commonly reports three types of errors: lost clusters; invalid clusters and lost file fragments; and cross-linked clusters. Of these, lost clusters are the most frequently identified problem. Clusters are chunks of storage space on the hard disk where files are kept. Every file takes up at least one cluster, and the size of the cluster depends on the size of the disk partition and on the file system used. A 1GB drive formatted under FAT16, for example, employs relatively wasteful 32KB clusters (so even a 1KB file consumes 32KB of space). The same drive formatted under FAT32, however, uses clusters that are much smaller—4KB. Files larger than a single cluster are stored in groups of clusters known as *chains*.

ScanDisk's 'lost clusters' error message means that Windows' File Allocation Table has lost track of a cluster and doesn't know where it should go. The program lets you save lost clusters to a file or delete them. In most cases, you should just delete these wayward clusters and move on. Though you can attempt to salvage the lost data, doing so means spending a lot of time rebuilding files with a low-level editing utility like Norton's Diskedit—or turning to an expensive data recovery service.

An 'invalid cluster' or 'lost file fragment' error message indicates that a portion of a file has been separated from the rest of that file. Again, you can choose to delete the fragment or save it to a file if you're desperate.

Finally, the 'cross-linked clusters' message indicates that multiple files are sharing a single cluster. You can untangle cross-linked files by using the applications that created them to resave the affected files. Or you can have ScanDisk create rescue files that contain the original data, writing the results to .chk files in the root directory of your computer's C: drive.

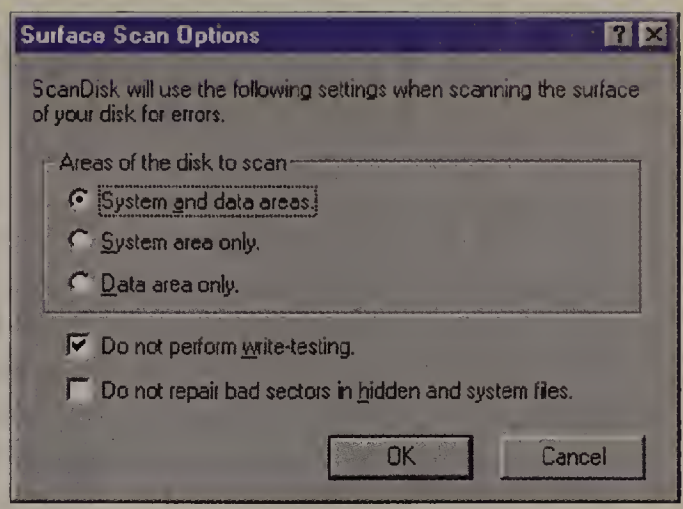


FIGURE 3: DISABLING WRITE TESTING will save time when ScanDisk scans the surface of large hard disks.

Of course, physical damage to the disk is a serious problem. To prevent data loss, your system must recognize and mark damaged disk sectors so Windows won't write data to them. ScanDisk will do this work for you, but only if you instruct it to. Select the *Thorough* test option from the opening ScanDisk screen (see **FIGURE 2**), and the program will conduct a disk surface scan. Don't be surprised if running this test takes a long time, especially if you have a multiple-gigabyte disk peppered with FAT32's tiny 4KB clusters.

You can speed things up by clicking the Options menu item and checking *Do not perform write-testing* before you start (see **FIGURE 3**). This option limits testing to data reads only, letting you identify surface flaws while paring down the workload.

If you suspect that a hard disk crash is imminent, test your system area files. If ScanDisk finds errors in these sectors—where the master boot record, as well as other critical disk information, is stored—you have a real problem. The configuration data in these sectors can't be moved elsewhere on the disk, and if the data becomes corrupted, you may lose access to your hard disk. If physical errors turn up here, back up the disk immediately and consider replacing it right away.

For additional hardware tips, see www.pcworld.com/heres_how. Kirk Steers is a PC World *contributing editor. We welcome your tips and questions and pay $50 for published items. See page 14 for contact information.* ■

Move Up to Windows NT 4.0

IS YOUR PC an essential part of your job? Do you use it for more than Web surfing and occasional word processing? Are you having stability problems with Windows 95 or 98? If the answer to these questions is yes, then it may be time to consider moving to NT Workstation 4.0, which is a more solid platform. And it looks and works like Windows 9*x*.

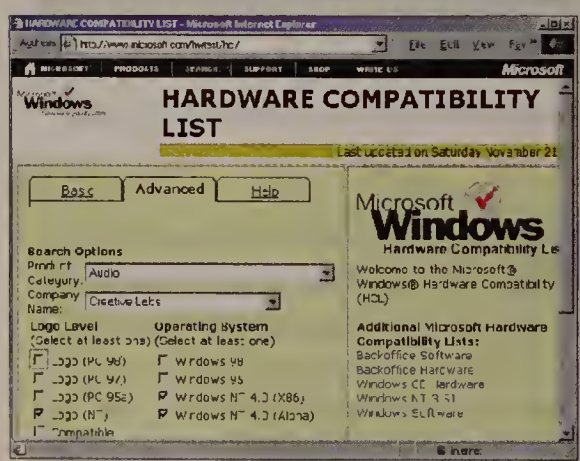
Yes, the next incarnation of NT—Windows 2000—is expected to be available sometime this year, but if you've made up your mind that you need to upgrade, don't wait; go with NT Workstation 4.0 now. With the arrival of the Service Pack 4 update and bug fix, most of NT 4.0's problems seem to be ironed out. And you'll run into fewer unexplained crashes than with Windows 9*x*. NT's design also ensures that one buggy application won't crash your entire system, meaning fewer reboots and assured, constant operation.

But naturally, there are caveats. For one, Windows NT Workstation retails in the $275 range, while Win 98 costs about $100. Win NT also lacks Plug and Play,

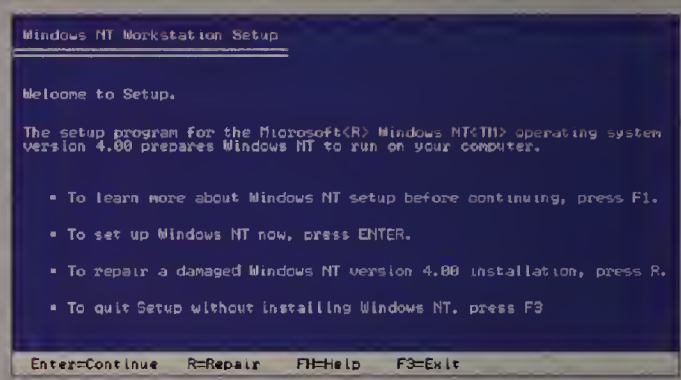
1 Be prepared. Installing NT requires a few more initial steps than when installing 9*x*. Most peripherals that require drivers include versions for NT 4.0, but chances are the ones you have are old. Your best bet is to download the latest drivers from the manufacturers' Web sites. Make sure you get all the drivers downloaded and copied to floppy disks before you start the upgrade. If any of your peripherals lack NT driver support, you'll have to consider a hardware upgrade (see step 5).

You can find out if your hardware is supported under NT by perusing the interactive Hardware Compatibility List on Microsoft's Web site (www.microsoft.com/hwtest/hcl), as shown below. This list will let you know if your hardware will work under NT and will even point you to the latest Microsoft-certified drivers. If you don't have Internet access, the NT 4.0 installation CD-ROM includes a device list, though it will be somewhat out of date.

Of course, you need to back up all your data and applications. It's also a good idea to test the backup media afterward, to make sure the data you've written is readable.

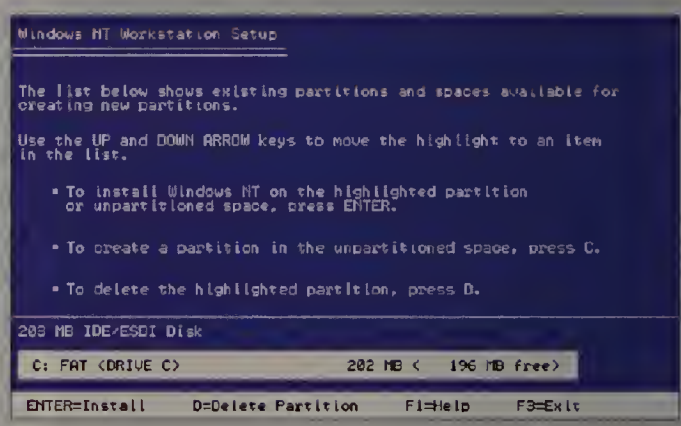


2 Start the installation. Three floppy disks come with NT. Insert Setup Disk 1 into your floppy drive and start your PC. Be patient as NT loads a bunch of files. Depending on your PC, you may be asked to insert one or both of the other floppies.



Eventually, you'll see the welcome screen. Note the "R" option, which lets you restart the installation if something unexpected happens. Other screens, including the obligatory license agreement, also appear.

3 Choose partition, file system, and directory. When you see a screen that shows the partitions on your PC's hard drives, read the instructions very carefully. The first partition is always highlighted. *Don't* press D, because that will erase everything on your disk. If you're setting up a dual-boot system, you can press <Enter> to use the existing partition. You can also set up NT on a second partition, in which case you can make use of the NT File System. NTFS will let you gain access to NT-specific features such as on-the-fly file compression and security, but only when you are running NT.



The next screen provides your file system options. By default, the 'Leave the current file system intact (no changes)' choice is highlighted. For dual booting, you'll get best compatibility with this option. If you intend to dual-boot and want to go with the 'Convert the partition to NTFS' option, make sure you install NT into a different partition from Windows 9*x*. Otherwise, Windows 9*x* won't run at all. (For more on dual-booting and file system issues, see this month's *Windows NT* column on page 236.)

In general, you should install NT to the default directory \WINNT if you want to dual-boot. Installing to the existing \WINDOWS directory will wipe out your 9*x* files. Unlike Windows 9*x*, however, NT doesn't limit you to installing the operating system on your C: drive.

At this point, you'll be prompted to enter an administrator name and password. Write them down—you'll need them to gain access to your NT system. Eventually, you'll be asked to remove the floppy disk and reboot your system.

USB support, and power management features. Finally, NT uses considerably more hardware resources than Windows 9*x*—older Pentium systems will run noticeably slower under NT than under 9*x*. Still, a 200-MHz Pentium MMX with 64MB of RAM will run quite nicely, putting NT within reach of many users.

Most 32-bit Windows applications work better under NT than they do under Windows 9*x*. Exceptions include some system utilities, virus checkers, and gaming software. Check your software for NT compatibility before you forge onward. If you still run DOS apps, stick with Win 9*x*—it works better with older, 16-bit software.

For best results, you should install Windows NT "clean," on a freshly formatted hard disk. If you aren't ready to give up on 9*x* entirely, you can install NT so that it runs side-by-side with 9*x*, under a dual-boot configuration. When your PC starts, you will see a text menu that lets you choose which operating system to run. Be aware that you must also reinstall your applications under NT.

Installing NT is more challenging than installing 9*x*. Because NT lacks Plug and Play, it won't automatically recognize and configure devices. You must input device configurations yourself after the initial setup is complete. And connecting to a network or Internet account requires some technical background. Carefully review the extensive setup information that comes with NT. If you feel overwhelmed, call your local computer dealer or a knowledgeable friend for help.

Below is an overview of the NT Workstation setup. See also this month's *Windows NT* column on page 236.

Stan Miastkowski is a PC World *contributing editor. See page 14 for contact information.* ■

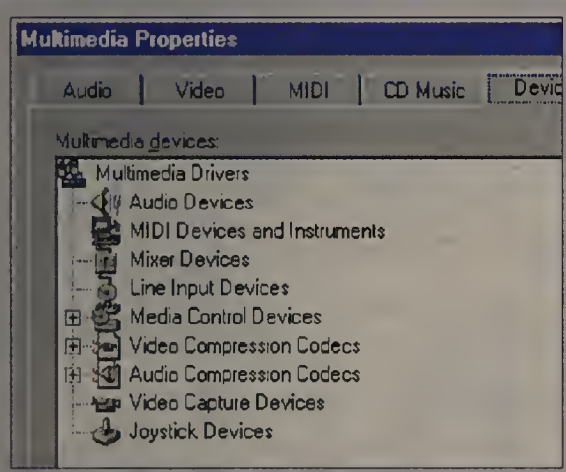
4 Follow the setup screens. From this point on, installing NT is similar to installing Windows 9*x*, although with a few crucial differences. Read each screen carefully—you'll see a lot of them.

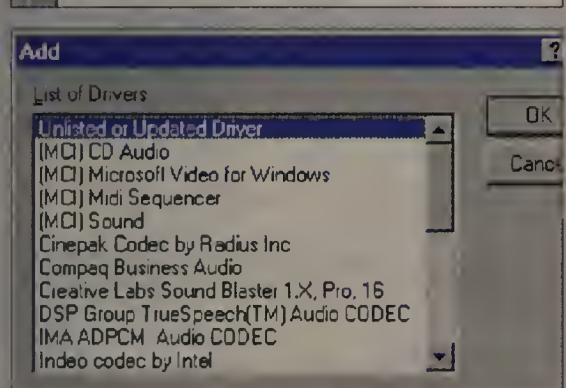
If your NT system will be connected to a network, you'll need to watch your step. NT Setup can automatically detect your network card and let you choose from a list, or install a driver from a floppy disk (if one came with your network card). In any case, planning is critical. Your network hardware must be configured and working before you can proceed.

You'll also need to choose and install protocols for networking. TCP/IP is used for the Internet, while NetBEUI is best for connecting to Windows PCs on a local area network (although you can use TCP/IP for this as well). If you have NetWare servers on your LAN, consider the IPX/SPX protocol. Many other network protocols are available, so review your NT documentation to ensure you have all the information you need to set up your network connection. Work closely with your system or network administrator, if you have one.

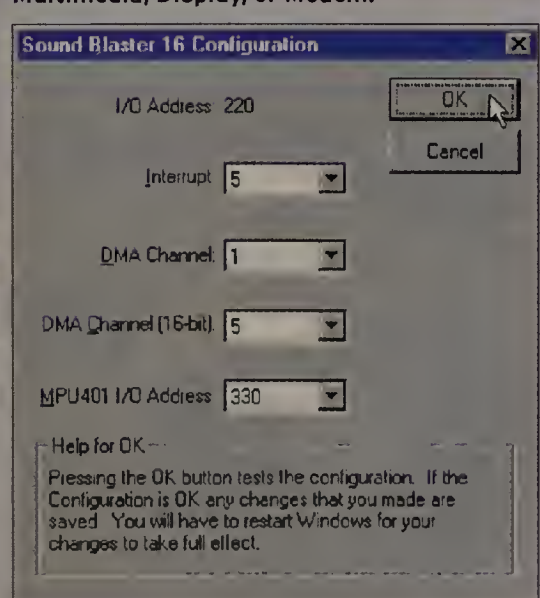
The final steps allow you choose a time zone, create an emergency repair disk (a crucial task), and copy required files. Eventually, you'll be asked to restart your PC.

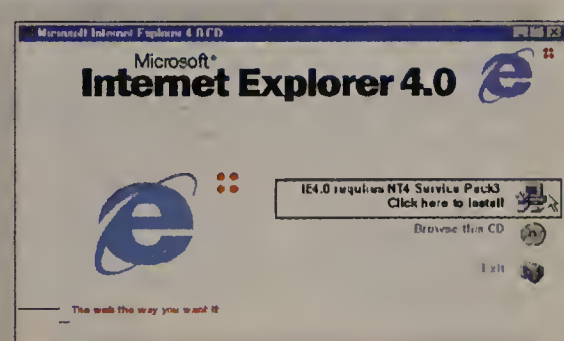
Unlike with Windows 9*x*, you need to press <Ctrl>-<Alt>-<Delete> to log on to NT, and enter the password you chose during setup. Once you've logged on to the system, the desktop will look almost identical to Windows 9*x*.





5 Install drivers. The next step is to install drivers for components such as your graphics card and sound card. Check the documentation that came with your components for NT instructions. If no such instructions exist, you can install most components by selecting *Start•Settings•Control Panel* and then selecting the associated icons, such as Multimedia, Display, or Modem.





6 Install the latest service pack. See if your version of NT 4.0 includes Service Pack 4, with updates and bug fixes needed for a solid system (as shown above, it may have SP3 instead). If it doesn't, download SP4 from www.microsoft.com/windows/downloads/contents/updates/nt4svcpk4, and follow the install instructions.

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#30978	780CDM	266 PII MMX	64	5.1GB	20X	13.3" TFT	56K	$2,659
#30976	780DVD	233 PII MMX	64	5.1GB	DVD	13.3" TFT	56K	$3,049
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#34810	7000CT	266 PII MMX	32	4.3GB	—	12.1" TFT	56K	$2,929
#39052	3010CT	266 MMX	32	4.3GB	—	10.4" TFT	56K	$1,999
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#34758	4000CDT	233 PII MMX	32	4.1GB	24X	12.1" TFT	56K	$1,749
#37253	4010CDS	266 PII MMX	32	4.1GB	24X	12.1" DSTN	56K	$1,759
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#37261	4020CDT	300 PII MMX	64	6.4GB	24X	13.3" TFT	56K	$2,899
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#35329	TP560X	233 PII MMX*	32	4GB	—	12.1" TFT	56K	$2,499
#35338	TP560X	300 PII MMX*	64	6.4GB	—	12.1" TFT	56K	$3,369
ThinkPad 600								
#35187	TP600	266 PII	64	5.1GB	24X	13.3" TFT	56K	$4,139
#35193	TP600	266 PII	64	6.0GB	OVO	13.3" TFT	56K	$4,399
ThinkPad 770								
#30325	TP770E	266 PII	32	5.1GB	—	14.1" TFT	33.6K	$3,759
#30327	TP770EO	266 PII	64	8.1GB	OVO	14.1" TFT	56K	$4,809
ThinkPad 390								
#38160	TP390	233 PII	32	3.2GB	24X	14.1" TFT	56K	$1,899
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*Windows 98 †Windows NT

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#36036	E335	233 PII MMX	32	3.2GB	24X	13.3" TFT	56K	W95	$1,999
#36038	E340	266 PII MMX	32	4.0GB	24X	13.3" TFT	56K	W95	$2,399
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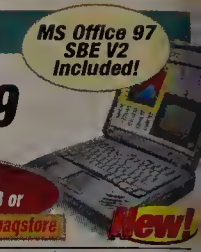

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#38848	330	450 PII MMX	64	10GB	DVD	T/D	Win98	$1,719
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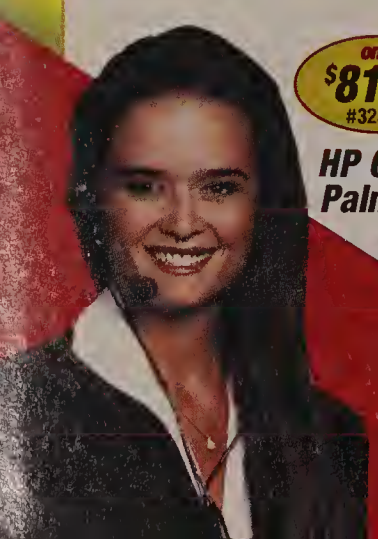

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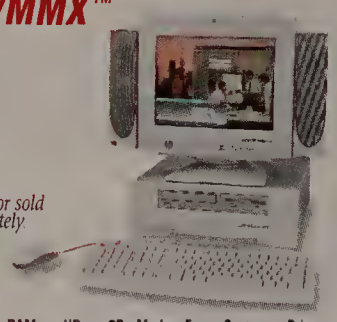

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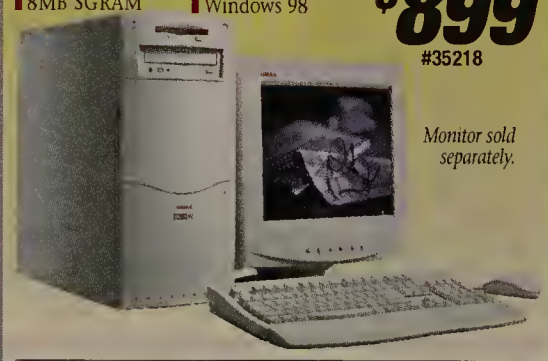

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#36607†	628513U	333 Celeron	32MB	3.2GB	—	W98	$899
#36590	627557U	350 PII	32MB	3.2GB	—	W98	$1,049
#36612	627575U	450 PII	64MB	6.4GB	32X	NT	$1,649
#36613	627574U	450 PII	64MB	6.4GB	—	NT	$1,549
#33327	627555U	350 PII	32MB	3.2GB	—	NT	$1,099
#33328	627556U	350 PII	64MB	3.2GB	—	NT	$1,149
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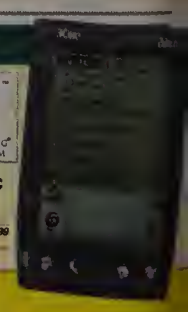

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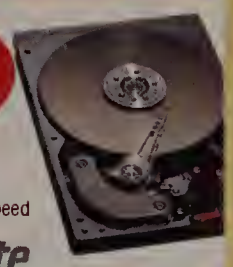

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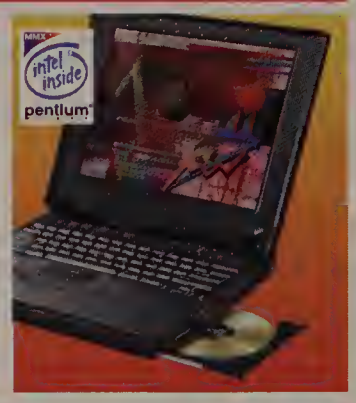

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941: Toshiba Satellite 4000CDS PII/233MHz, 4.0GB, 32MB, 20X, 56K, 12.1" SVGA DSTN	$1499.00
940: Toshiba Satellite 4000COT PII/233MHz, 4.0GB, 32MB, 20X, 56K, 12.1" SVGA TFT	$1699.00
260: Toshiba Satellite 4010CDS PII/266MHz, 4.0GB, 32MB, 20X, 56K, 12.1" SVGA DSTN	$1599.00
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1B1: Compaq Armada 1700 PII/233MHz, 3.2GB, 32MB, 24X, 56K, 12.1" SVGA CSTN	$1699.00
217: Compaq Armada 1700 PII/266MHz, 4.0GB, 32MB, 24X, 56K, 13.3" XGA CTFT	$2649.00

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109: Compaq Deskpro EN Celeron/333MHz, 32MB, 6.4GB, 32X, Win 95, MT	$1169.00
765: Compaq Deskpro EN PII/350MHz, 32MB, 6.4GB, NIC, Win NT, DT	$1399.00
104: Compaq Deskpro EN PII/450MHz, 64MB, 10GB, NIC, Win NT, MT	$1B99.00
090: IBM PC300GL PII/350MHz, 32MB, 3.2GB, Win 9B, DT	$1029.00
094: IBM PC300PL PII/350MHz, 32MB, 3.2GB, Win 9B, DT	$1319.00
096: IBM PC300PL PII/450MHz, 64MB, 6.4GB, 32X, Win NT, MT	$1B39.00
069: HP Brio B531 PII/350MHz, 32MB, B.0GB, 32X, MT, Win 9B	$1199.00
970: HP Brio B532NT PII/400MHz, 64MB, B.0GB, 32X, MT, Win NT	$1599.00

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PR12B64: HP DeskJet 722C Bppm blk/4ppm color NEW!	$279.95
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PR14147: Xerox DocuPrint N17 17ppm/1200 x 600 dpi/network	$1299.00
PR14305: Xerox DocuPrint P12 12ppm/600 dpi/optional network	$699.95
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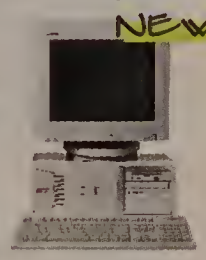

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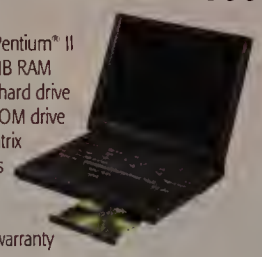

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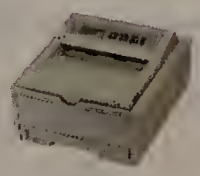

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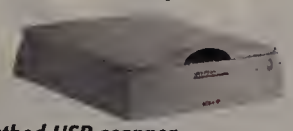

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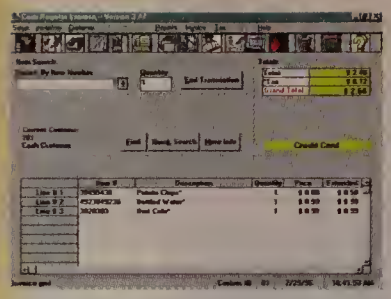

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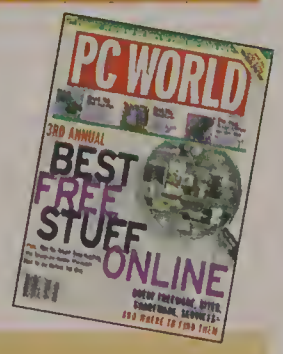

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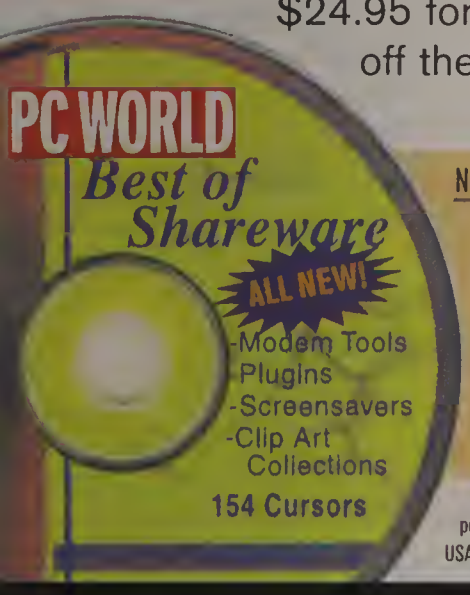

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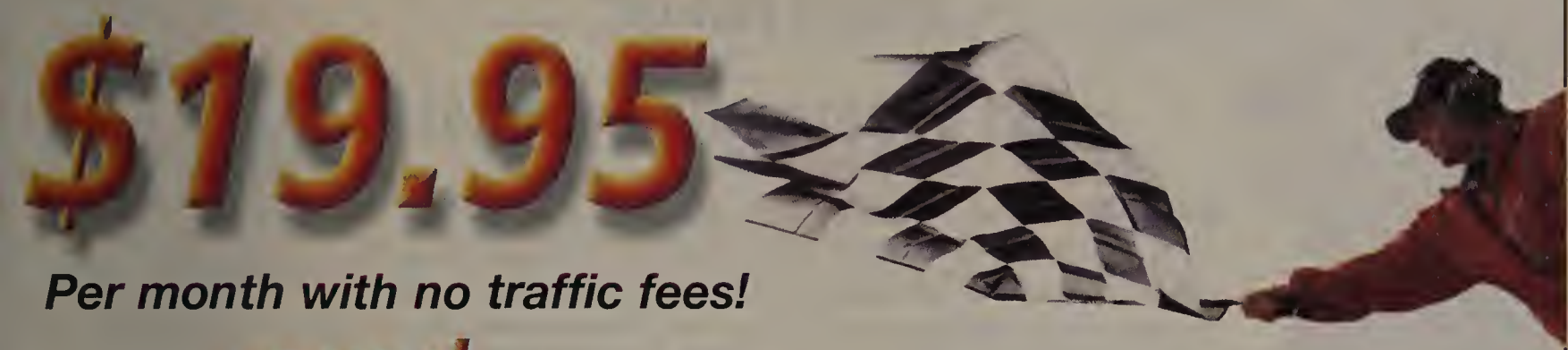

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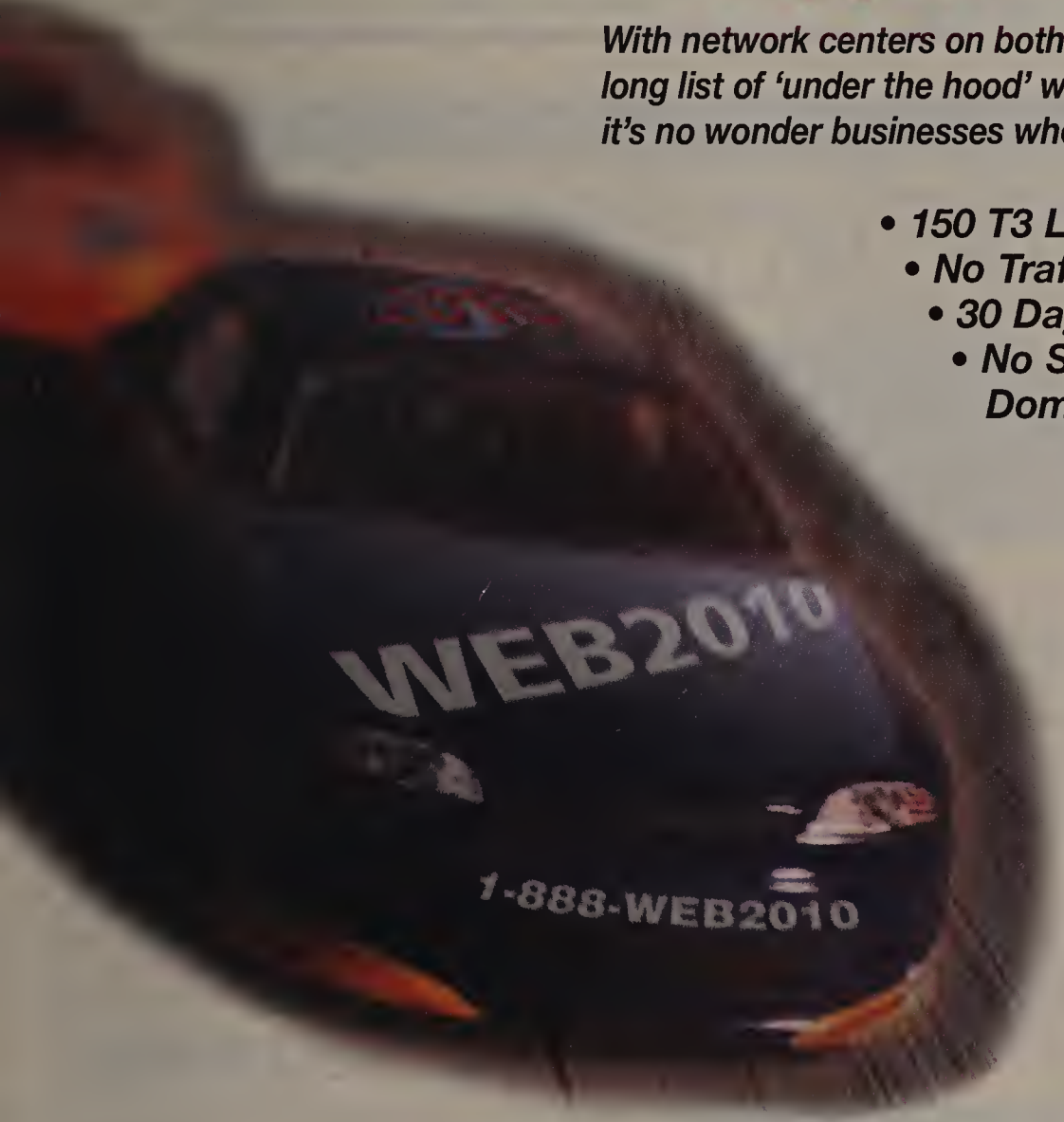

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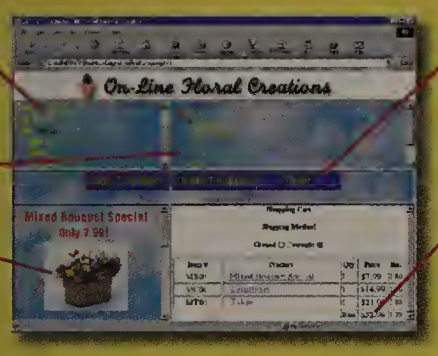

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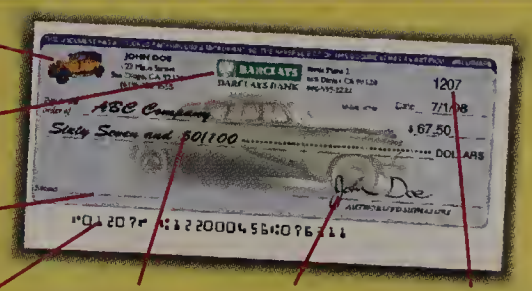

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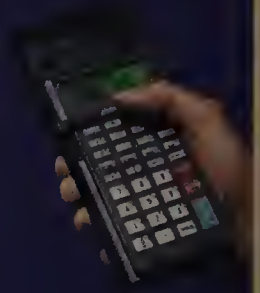

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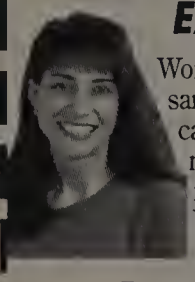

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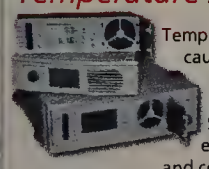

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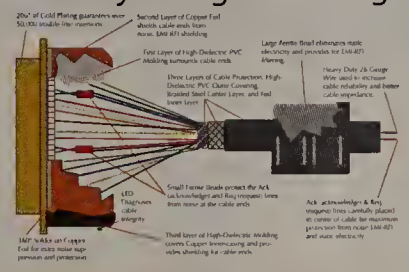

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Now you can take all your SCSI devices and run them any distance you want, (up to 75 feet) while sharing the Ultra 2 SCSI bus. This revolutionary Repeater / Converter will give you, not only long cable distance, but also complete compatibility with the new Ultra 2 standard. There is no need to have two SCSI Adapters taking up precious PCI slots. Two models are available, the internal model that mounts into your enclosure, Raid/Array case, and the external that can be used anywhere.

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If you integrate SCSI Raids or Arrays and are having problems making it work, the Granite SCSI Repeater will make it work. Designed to fit inside any computer or external case. These repeaters will double the cable length of any scsi bus allowing you to achieve the needed distance to make your system operate. Up to 2 repeater can be used per channel.

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This Digital SCSI Cable Tester can test all the popular cable styles for opens, shorts, and unreliable operation. Battery powered for easy use anywhere you need it. Three models to choose from:
- **50** pin IDC
- **50** pin Centronics
- **68** pin MicroD

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Considered "The Bible" of SCSI Books, it includes chapters on SCSI Basics thru Advanced SCSI. Written so that all of us can understand it, this is a reference guide that can be used by anyone. Its the best SCSI we have seen.

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A combination of SCSI Utilities that helps you manage and diagnose SCSI problems. Allows you to set the drive for AV or Data optimization. Does custom block by block copies. Allows you to monitor SCSI operations. For Windows 3xx, 95 and NT.

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Benefits:
- Less Errors, Ultimate Performance
- TPO Shield Improves Signal Quality

Features:
- Perfect 132 Ohm Impedance • Custom in 1 Day
- Triple Pronged Connector - Gold contacts Silver Wire

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68 Pin Internal Cable

From: $39

68 Pin Internal LVD Cables, custom or stock, from 1 to 15 SCSI devices per cable. The perfect cable for LVD. We usually take just 1 to 2 days to process all orders, including custom cables!

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DIMMS (168 pin)

SDRAM - 66MHZ, 100MHZ, 133MHZ, 10ns, 8ns	x64	x72 ECC	PC-100	PC-100 ECC	CAS LATENCY 2 PC-100 64 Bit	CAS LATENCY 2 PC-100 72 Bit ECC
					Non-Reg. / Registered	Non-Reg. / Registered
8Meg	—	—	—	—		
16Meg	29	—	39	49		
32Meg	48	59	49	64	—	—
64Meg	108	129	109	128	129 / 149	129 / 149
128Meg	198	239	209	249	279 / 299	279 / 299
256Meg	579	619	699	799	659 / 799	659 / 799

INDUSTRY STANDARD DIMMS	16Mg	32Mg	64Mg	128Mg	256Mg
Unbuffered					
3.3V ECC, EDO	44	74	119	259	—
3.3V EDO	34	59	109	249	—
Buffered					
3.3V ECC, EDO	44	74	119	259	569

72 PIN SIMMS (FPM, EDO)

	60NS	70NS	80NS
1 x 32 4 mg	8	8	8
2 x 32 8 mg	15	15	15
4 x 32 16 mg	25	25	–
8 x 32 32 mg	46	46	–
16 x 32 64 mg	119	119	–
1 x 32 4 mg EDO	10	10	–
2 x 32 8 mg EDO	14	14	–
4 x 32 16 mg EDO	22	22	–
8 x 32 32 mg EDO	45	45	–
16x32 64 mg EDO	119	119	–
256 x 36	–	14	14
512 x 36	–	3	–
256 x 32	–	3	–
512 x 32	–	4	–
1 x 36 4 mg	14	14	14
2 x 36 8 mg	25	25	25
4 x 36 16 mg	34	34	–
8 x 36 32 mg	59	59	–
16 x 36 64 mg	169	169	–

MOTHERBOARDS

P-75 – P233MMX, 4PCI, 4ISA
79.00

AMD K6-2, 100 MHZ Bus
89.00

Pentium II, BX Chipset, PC-100
159.00

SIMM MODULES

	60NS	70NS	80NS
1Meg x 3 (3 chip)	4.00	4.00	4.00
1Meg x 9 (9 chip)	4.00	4.00	4.00
4Meg x 3 (3 chip)	12.00	12.00	-
4Meg x 9 (9 chip)	14.00	14.00	14.00
16Meg x 9 (9 chip)	59.00	59.00	-

DELL MEMORY

Model	Amount	Price
Dimension XPS M166S, M2D90, P133s, 166s, 200s, P133v, 166v, 200v (SDRAM)	16Meg/32Meg	29/49
Dimension XPS P60, P75, P90, P100 (pairs)	4Meg/8Meg/16Meg/32Meg	9/19/29/49
Dimension XPS P100c, 120c, 133c, 166c, XPS P75T, 100T (pairs) FPM or EDD	4Meg/8Meg/16Meg/32Meg	9/19/29/49
Dimension XPS Pro 150, Pro 200 (quads)	4Meg/8Meg/16Meg/32Meg	9/19/29/49
Dimension XPS Pro 150n, 180n, 200n (Edo pairs)	4Meg/8Meg/16Meg/32Meg	9/19/29/49
Dimension XPS D233, D266, D300 (SDRAM ECC)	16Meg/32Meg/64Meg/128Meg	49/69/129/239
Dptiplex GXA	32Meg/64Meg/128Meg	69/129/239
Dptiplex GL, GM, GMT (Edo pairs)	4Meg/8Meg/16Meg/32Meg	9/19/29/49
Dptiplex GS, GXL, GXM, GXMT (Edo pairs)	4Meg/8Meg/16Meg/32Meg	9/19/29/49
Dptiplex GXI, GXpro, 6180, 6200 (Edo, Ecc)	16Meg/32Meg/64Meg/128Meg	49/69/129/239
PowerEdge 2100, 4100 (Edo, Ecc)	16Meg/32Meg/64Meg/128Meg/256Meg	59/99/184/399/599

GATEWAY MEMORY

Model	Amount	Price
Dest. 8ig Screen D5 – SDRAM	16Meg/32Meg/64Meg	29/49/99
Dest 8ig Screen D6 – EDD (pairs)	4Meg/8Meg/16Meg/32Meg	9/19/29/49
Family PC w/MMX – SDRAM	16Meg/32Meg/64Meg	29/49/99
G5-166, 200 Prof. System – SDRAM	16Meg/32Meg/64Meg	29/49/99
G5-166M, 200M MMedia System – SDRAM	16Meg/32Meg/64Meg	29/49/99
G6-200 Prof. System – SDRAM	16Meg/32Meg	29/49
G6-Prof, M MMedia System – EDO	4Meg/8Meg/16Meg/32Meg	9/19/29/49
Multimedia G-5 Systems – SDRAM	16Meg/32Meg/64Meg	29/49/99
Prof, P-5 Series – SDRAM	16Meg/32Meg/64Meg	29/49/99

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CPU CHIPS

INTEL					
Pentium II 450 MHZ	$750	Pro 200 256K/512K	249/450	Celeron 300/300A/333	99/189/219
Pentium II 400 MHZ	550	Pentium 233 MMX	139	**AMD**	
Pentium II 350 MHZ	379	Pentium 200 MMX	129	K6-266	105
Pentium II 333 MHZ	289	Pentium 166/166MMX	79/129	K6-300	129
Pentium II 300 MHZ	275	Pentium 133/150	59/79	K6-2-300MHZ/350MHZ	139/259
Pentium II 266 MHZ	229	Pentium 90/100	49/S9	K6-2-266MHZ/333MHZ	105/169
		486 DX4-100 / DX2-66	45/2S	K6-200MHZ233 MHZ	89/105

IBM APTIVA, PC, P/S1 & P/S2

Model	Amount	Price
Aptiva 300, 500 Series	4Meg/8Meg/16Meg/32Meg	11/19/29/49
Aptiva 2136 (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
Aptiva 2137, 214D, 2142 (SDRAM)	16Meg/32Meg/64Meg/128Meg	39/59/109/209
Aptiva A, M, 300, 500, 700 Series	4Meg/8Meg/16Meg/32Meg	11/19/29/49
Aptiva C, S,L Series (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 330 Models 6571-6576	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 330 Model 6577 (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 350 Models 6581-6585	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 350 Model 6586 (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 350 Model 6587 (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 730 Models 6875-6876 (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 73D Model 6877 (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 750 Models 6885-6886 (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 7S0 Model 6887 (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC Server 310 (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49

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IBM NOTEBOOK/LAPTOP MEMORY

MODEL	AMT. UPGRADED	MEMORY PRICE	BATTERY NimH/LI-on
Thinkpad 310E, ED, 315	16Meg/32Meg	49/79	
Thinkpad 340, 345, 355, 360, C, CE	4Meg/8Meg/16Meg	49/59/79	119/—
Thinkpad 365C, CS, CD, E, ED	4Meg/16Meg	39/94	105/—
Thinkpad 365X, 365XD	8Meg/16Meg/32Meg/64Meg	29/44/89/179	105/—
Thinkpad 380, 380D, 385D	8Meg/16Meg/32Meg/64Meg	29/44/89/179	119/238
Thinkpad 500, 510CS	4Meg/8Meg/16Meg	49/59/89	168/189
Thinkpad 560, 560E, 560X, 380X, XD	8Meg/16Meg/32Meg/64Meg	29/44/89/159	241/—
Thinkpad 700, 720, 750, CL57SX	4Meg/8Meg/16Meg/32Meg	49/79/99/169	140/175
Thinkpad 701, 701C, 701CS	4Meg/8Meg/16Meg/32Meg	19/29/59/119	119/—
Thinkpad 755C,CE,CD,CS,CDV,CSE,CV	4Meg/8Meg/16Meg/32Meg	49/69/99/169	140/271
Thinkpad 760C, CD, L, LD	8Meg/16Meg/32Meg	34/59/119	140/271
Thinkpad 760E, ED, EL, ELD	8Meg/16Meg/32Meg	34/44/89	140/271
Thinkpad 760XD, 760XL	8Meg/16Meg/32/64Meg	29/44/89/159	140/271
Thinkpad 765D, 765L	8Meg/16Meg/32Meg/64Meg	29/44/89/159	140/271
Thinkpad 600, 770 ED, 770 (SDRAM)	16Meg/32Meg/64/128Meg	44/89/149/389	

LASER PRINTER MEMORY UPGRADES

AMOUNT UPGRADED	256k	1	2	3	3.5	4	5	8	16	32
Brother 630, 631, 641, 645	–	39	59	–	–	–	–	–	–	–
Canon LBP 430	–	9	–	–	–	14	–	–	–	–
Canon LBP 860, 1260	–	–	9	–	–	14	–	29	44	69
Epson Action Laser 1100, 1600	–	14	19	–	–	14	–	29	49	–
Epson Action Laser II	–	59	–	89	–	–	119	–	–	–
Epson 8000, 1800, 4000, 4100, 4300	–	59	–	89	–	–	119	–	–	–
Epson 1000, 1500, 5000, 5200	–	–	30	–	–	60	–	–	–	–
HP 2, 2D–	–	–	59	–	–	79	–	–	–	–
HP 3, 3D, 3P, 2P+	–	–	59	–	–	79	–	–	–	–
HP 4, 4M, 4Si, 4SIMX	–	–	9	–	–	19	–	39	–	–
HP 4L	–	29	–	–	–	–	–	–	–	–
HP 4MP, 4P	–	5	14	–	–	19	–	29	–	–
HP 4+, 4M+, 4V, 4MV	–	5	14	–	–	19	–	29	49	69
HP 5, 5M, 5MP, 5N, 5P, 5SI, 5MX	–	5	14	–	–	19	–	29	49	69
HP 5L, 6L	–	–	–	–	–	29	–	44	–	–
HP 6MP, 6P	–	9	19	–	–	19	–	39	49	69
HP Laser Jet 4000, 5000	–	–	–	–	–	21	–	49	90	149
HP Design Jet 200, 220	–	–	–	–	–	19	–	34	–	–
HP Design Jet 230, 250C	–	–	–	–	–	19	–	34	44	69
HP Design Jet 330, 350C	–	–	–	–	–	19	–	34	44	69
HP Design Jet 600, 650C	–	–	–	–	–	19	–	34	–	–
HP Design Jet 650C PS	–	–	–	–	–	19	–	34	44	69
HP Design Jet 700, 750C, Plus, 75S	–	–	–	–	–	19	–	34	44	69
HP Deskjet 500, 500C, 510, 550 560	29	–	–	–	–	–	–	–	–	–
HP Deskjet 1200C, 1200C/PS, 1600C, 1600CM	–	–	–	–	–	19	–	34	–	–
IBM Laser 4019, 4019E	–	–	–	–	109	–	–	–	–	–
IBM Laser 4029, 4037	–	–	–	–	–	49	–	–	–	–
IBM Laser 4039, 4079	–	–	39	–	–	49	–	99	–	–
Lexmark, Optra L, LX, R, RX	–	–	–	–	–	19	–	29	39	69
Lexmark Valuwriter 300, 600	–	29	39	–	–	49	–	–	–	–
Lexmark Winwriter 200, 400, 600	–	29	39	–	–	49	–	–	–	–
Lexmark S Series	–	–	–	–	–	–	–	19	39	69
NEC 95, 97	–	–	59	–	–	–	–	–	–	–
Dki 400E, 400EX, 410E, 41DEX	–	67	89	169	–	189	–	–	–	–
Dki 810E, EX, 600E, EX, 610E, EX	–	29	79	–	–	119	–	149	229	–
Panasonic 4420/4450I	–	–	79	–	–	99	–	–	–	–
Panasonic 4410/4430	–	–	59	–	–	99	–	–	–	–
Panasonic 4450	–	89	–	–	–	–	–	–	–	–
Panasonic 4400/5400	–	49	69	–	–	99	–	–	–	–
Panasonic 4440, 5410	–	69	–	–	–	99	–	–	–	–
Panasonic 6500	–	14	14	–	–	49	–	–	–	–
Sharp 9400, 9460, 9600, 9700E	–	49	69	–	–	119	–	–	–	–
Sharp 9500, E, H, 9700, H	–	49	–	–	–	236	–	–	–	–

CHECK OUT OUR WEBSITE FOR MORE UPGRADES!

COMPAQ MEMORY MODULES

Model	Amount	Price
Deskpro 450, 4100, 575, 590, 5100, 5133	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Deskpro 575, 5120, 5133, 5150, 5160 (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Deskpro 2000, 4000, 6000 Series (EDO, pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Deskpro 2000, 4000, MMX	16Meg/32Meg/64Meg/128Meg	29/49/99/199
Deskpro 6000	16Meg/32Meg/64Meg/128Meg	34/59/109/229
Deskpro 5/60M, 5/66M, XE560 (quads)	4Meg/8Meg/16Meg/32Meg	14/24/39/69
Deskpro XL 6150, 62D0 (ECC, pairs)	8Meg/16Meg/32Meg/64Meg/128Meg	Call
Presario 51D, 520, 524, 660, 720, 724, 860	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Presario 920 924, 954, 974, 978, 992	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Presario 2100,2120,2200,302D,3060 (EDD pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Presario 4112, 4122, 4160, 4402 (EDO pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Presario 4504, 4508, 4528 (SDRAM)	16Meg/32Meg	34/69
Presario 4704, 4706, 4710, 4712, 4714 4716 (EDD pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Presario 4764, 4770, 4784, 4786 (SDRAM)	16Meg/32Meg	34/69
Presario 4808, 4814 (SDRAM)	16Meg/32Meg	34/69
Presario 7170, 7180, 9536, 9546, 9548, 9564 (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Presario 9232, 9234, 9240, 9250, 9642, 9660 (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Proliant 1000 5/60, 2000, R, 4000, R (quads)	4Meg/8Meg/16Meg/32Meg	14/24/39/69
Proliant 1500, 1500R (pairs)	4Meg/8Meg/16Meg/32Meg	14/24/39/69
Proliant 4500, 4500R (quads)	4Meg/8Meg/16Meg/32Meg/64Meg	9/29/44/69/129
Proliant 5000, 5000R (pairs)	32Meg/64Meg/128Meg/256Meg	Call
Prolinea 575, 590, 5100, 5120, 5133 (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Prolinea 5100, 5120, 5133, 5150, 5166 (EDD pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Prolinea 575E, 100E, 120E, 575MX (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Prolinea 590MX, 5120MX (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Prolinea 6150E, 6180E (pairs)	8Meg/16Meg/32Meg	34/49/79
Prosignia 300 5/75, 5/90, 5/120, 5/150 (pairs)	4Meg/8Meg/16Meg/32Meg	14/24/39/69
Prosignia 500 5/90, 5/120, 5/150 (pairs)	4Meg/8Meg/16Meg/32Meg	14/24/39/69

COMPAQ NOTEBOOK/LAPTOP MEMORY

MODEL	AMT. UPGRADED	MEMORY PRICE	BATTERY NimH/LI-on
Armada 1100, 1120T, 1120, 1125	8Meg/16Meg/32Meg/64Meg	29/49/89/179	104/—
Armada 1130, 1130T	8Meg/16Meg/32Meg/64Meg	29/49/89/179	104/—
Armada 1510DM, 1520DM, 1550DMT	16Meg/32Meg/64Meg	49/79/1S9	139/229
Armada 1700, 7800	16Meg/32Meg/64Meg/128Meg	49/89/169/299	
Armada 4100, 4110, D, 4120 T, 4130T (pairs)	8Meg/16Meg/32/64Meg	34/65/89/189 ea	—/219
Armada 7710MT, 7730MT, 7750DMT	16Meg/32Meg/64Meg	49/89/159	—/229
Concerto 4/25, 433	4Meg/8Meg/16Meg	9/59/79	105/—
Contura 4/25, 4/25C, 4/25CX	4Meg/8Meg/16Meg	39/59/79	119/—
Contura 400C, 400CX, 410C, 410CX	4Meg/8Meg/16Meg/24Meg	39/59/79/99	104/—
Contura 420C, 420CX, 430C, 430CX	4Meg/8Meg/16Meg/24Meg	39/59/69/99	104/—
Contura Aero	4Meg/8Meg/16Meg	39/49/89	104/—
LTE 5000, 5100, 5200, 5300	8Meg/16Meg/32Meg/64Meg Kit	69/99/199	138/259
LTE Elite 440C, CX, 4/75CX	4Meg/8Meg/16Meg/24Meg	39/54/69/99	138/—
LTE Lite 425	4Meg/8Meg/16Meg	49/59/79	147/—
Presario 1000, 1010, 1020, 1030, 1070, 1080	8Meg/16Meg/32Meg	29/49/89	110/217
Presario 1207, 1210, 1610, 1615, 1620,1680	16Meg/32Meg/64Meg	44/89/139	112/238
Presario 1230, 1232, 1625, 1640, 1650, 1655	16Meg/32Meg/64Meg	44/89/139	

TOSHIBA LAPTOP MEMORY

MODEL	AMT. UPGRADED	MEMORY PRICE	BATTERY NimH/LI-on
Libretto 50CT, 70CT	8Meg/16Meg	39/69	—/161
Tecra 500CDT, CS, 510CDS, CDT	8Meg/16Meg/32Meg/48Meg/128Meg	29/49/89/129/269	231/239
Tecra 520CDT, 530CDT	8Meg/16Meg/32Meg/48Meg/128Meg	29/49/89/129/269	259—
Tecra 700CS, 700CT (SDRAM)	8Meg/16Meg/32Meg	59/89/149	279/259
Tecra 710CDT 720CDT, 730CDT	8Meg/16Meg/32Meg/64Meg/128Meg	39/59/89/149/299	279/259
Tecra 750CDT, COM,DVD, 780 CMD	8Meg/16Meg/32Meg/64Meg	39/59/89/179/159	
Tecra 730XCDT, 740CDT	8Meg/16Meg/32Meg/64Meg/128Meg	49/69/119/189/359	279/259
T1900, T4500, T4600, T4700, T4900 All Models	4Meg/8Meg/16Meg/32Meg	39/49/69/119	104/—
Satellite T100CS, 105CS, 110CS, 110CT, 115CS	8Meg/16Meg/32Meg	39/S9/89	104/—
Satellite 200CDS, 205CDS Series	8Meg/16Meg/32Meg	39/59/89	104/—
Satellite 220CDS, 225, 300, 315, 325	16Meg/32Meg/48Meg/64Meg/128Meg	49/79/129/159/289	196/208
Satellite 2505	16Meg/32Meg/64Meg	49/89/169	
Satellite 4005 CDS/CDT	32Meg/64Meg/128Meg	99/149/369	
Satellite 320 CTS, 325, 330, 335	16Meg/32Meg/64Meg/128Meg	49/89/169/369	
Satellite T400 Series, T600 Series	8Meg/16Meg/32Meg	39/59/89	196/208
Satellite Pro 440, 445, 460	8Meg/16Meg/32Meg/48Meg/128Meg	29/49/79/129/159/289	196/200
Satellite Pro 490 XCDT, 490 CDT	16Meg/32Meg/64Meg/128Meg	49/89/169/299	
Portege 610CT, 620CT	8Meg/16Meg/32Meg	39/59/89	
Portege 650CT, 660CT	8Meg/16Meg/32Meg/64Meg/128Meg	29/49/79/159/289	—/210

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ACERNote Light 356, 358, 359, 361 (pairs) edo	4Meg/8Meg/16Meg	19/29/64 ea	147/—
ACERNote Nuovo 971, 972, 372, 373, 374	8Meg/16Meg/32Meg	29/49/79	
ACERNote Pro 950, 954, 955, 957, 959 (pairs)	4Meg/8Meg/16Meg	19/29/64 ea	
AST Ascentia A Series and M Series	8Meg/16Meg/32Meg/54Meg	29/49/78/139	154/219
AST Ascentia P30, P50	8Meg/16Meg/32Meg	49/69/109	—/299
AST Ascentia J10, J30,J50 (pairs)	4Meg/8Meg/16Meg/20Meg	19/29/69/89 ea	—/168
AST Ascentia 800N, 810N, 900N, 910N	4Meg/8Meg/16Meg	46/58/79	105, 147/187
AST Ascentia 950N	8Meg/16Meg	59/79	—/187
AST Ascentia M5230 J/M 5260X	16Meg/32Meg/64Meg	49/89/169	
AT&T Globalyst 130	4Meg/8Meg/16Meg	19/29/59	103/—
Austin DX4, DX2, SX2, SX Series	4Meg/16Meg	69/169	126/—
Canon Innova Book 350CD, 360, 475 (pairs)	8Meg/16Meg	29/59 ea	119/—
Canon Innova Book 480, 490 EDO (pairs)	8Meg/16Meg	29/59 ea	119/—
CTX EZ Book 500, 600 Series	4Meg/8Meg/16Meg	19/29/59	138/—
CTX EZ Book 700 Pent. Series (EDD) (pairs)	4Meg/8Meg/16Meg/32Meg	19/29/69/109 ea	138/—
CTX EZ Book 760MT, 765MT (EDD) (pairs)	8Meg/16Meg/32Meg	29/69/119 ea	138/—
DEC HiNote Ultra, Ultra II	4Meg/8Meg/16Meg/32Meg	19/29/69/99	—/239
DEC HiNote Ultra 2000	16Meg/32Meg/64Meg	49/79/149	
DEC HiNote VP 520,525,535,545/150MMX (pairs)	4Meg/8Meg/16Meg	19/29/59 ea	119/259
DEC HiNote VP 51D0, 5120	8Meg/16Meg/32Meg/64Meg	29/49/79/169	119/—
DEC HiNote VP, CSS, LSS, CTS, LTS	8Meg/16Meg/32Meg/64Meg	29/49/79/169	119/—
DEC HiNote VP700, 703	16Meg/32Meg/64Meg	49/79/149	
Dell Inspiron 3000	16Meg/32Meg/64Meg	49/79/139	—/229
Dell Latitude CP & CPI Series	16Meg/32Meg/64Meg	49/89/169	
Dell Latitude LM, LM P166MMX (pairs)	4Meg/8Meg/16Meg/32Meg	19/29/59/99 ea	—/245
Dell Latitude 433, C, CX	4Meg/16Meg	49/79	119/—
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Epson ActionNote 650, 650c, 660c, 660cx	4Meg/8Meg/16Meg	9/59/89	119/—
Epson ActionNote 880, 866c, 890, 910	4Meg/8Meg/16Meg/20Meg	19/29/69/99	119/—
Epson ActionNote 4LC/25, 4LC/33, 4SLC/2-50, 4000	6Meg	69.00	70/—
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Fujitsu Lifebook 500, 600, 700, 900 Series	16Meg/32Meg/64Meg	49/79/139	103/203
Fujitsu Monte Carlo, Montego, Milan	8Meg/16Meg/32Meg/64Meg	29/49/79/149	—/203
Gateway 2000 Colorbook 4/33	4Meg/16Meg	69/179	112/—
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Gateway Solo Series 2100, 2200 edo	8Meg/16Meg/32Meg	49/79/179	—/219
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Micron MilleniaTransport Pentium (pairs), MRX	8Meg/16Meg	29/59 ea	
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NEC Versa 2600 Series (pairs)	4Meg/8Meg/16Meg	19/29/59 ea	
NEC Versa 400D, 4050/4080, 4200, 423D	4Meg/8Meg/16Meg/20Meg	39/49/79/139	—/219
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Twinhead, Altima, Compudyne, 486SX, DX, Tandy 4860	4Meg/16Meg	49/79	135/—
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Winbook XP5	32Meg	139	112/217
Winbook LM	8Meg/16Meg	29/59	
Zenith Z-Star EX, ES	4Meg/16Meg	19/29/69	09/—
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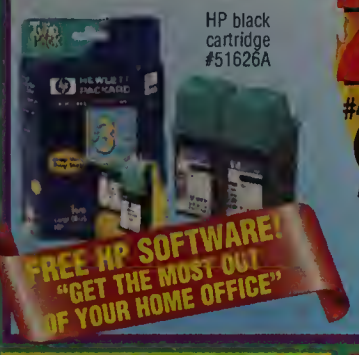

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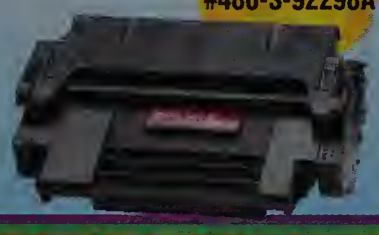

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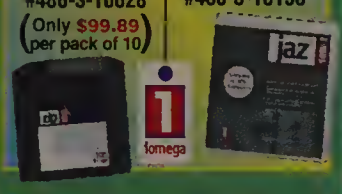

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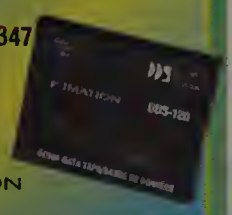

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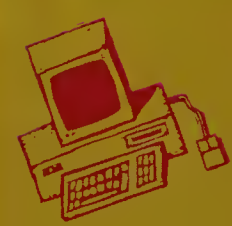

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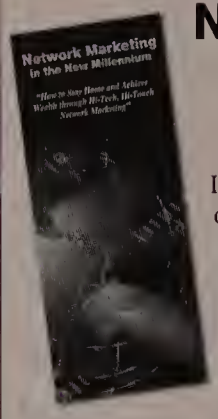

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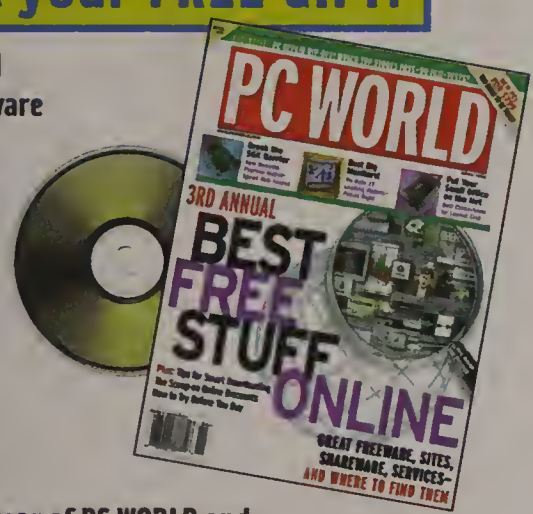

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AMD K6-2	400MHz	128MB	10.2GB	$1129.99	(CTLTM37)
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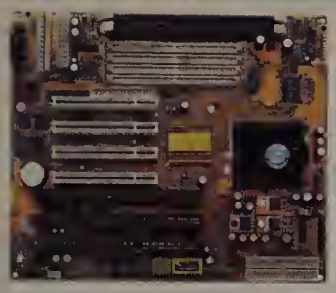

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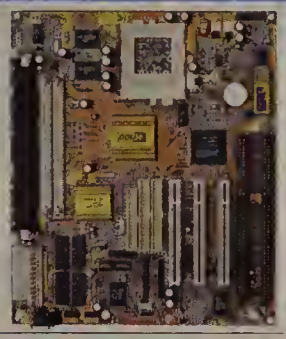
Tiger 571 Motherboard Features At-A-Glance

Form Factor: **Baby AT**	On Board Video: **4MB**	ISA Slots: **3**
Processor: **Socket 7**	On Board Audio: **YES**	Memory: **DIMM or SIMM**
Bus Speed: **Up to 83MHz**	PCI Slots: **4**	Max Memory: **384 MB**

Tiger 590 AT AGP Super Socket 7



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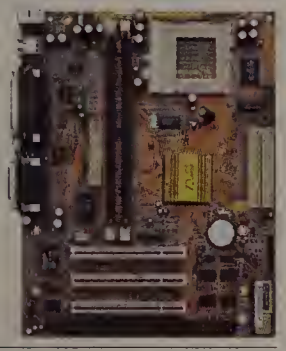
Pre-Assembled Kits: Motherboard in dual-cooling fan case; 200 Watt power supply, keyboard, speakers, mouse, microphone, 3D AGP video, 56KFlex fax-modem, 1.44MB floppy drive, 24X CD-ROM, Wave Table sound.

Tiger 590 Motherboard Features At-A-Glance

Form Factor: **AT**	On Board Video: **8MB AGP**	ISA Slots: **2**
Processor: **Super Socket 7**	On Board Audio: **YES**	Memory: **DIMM or SIMM**
Bus Speed: **Up to 100MHz**	PCI Slots: **3**	Max Memory: **256MB**

Tiger 596 Micro-ATX Socket 7



Motherboard & Case: Motherboard mounted in dual-cooling fan mini case; 140 Watt power supply, cables, manual

Pre-Assembled Kits: Motherboard in dual-cooling fan mini case; 140Watt power supply, keyboard, speakers, mouse, microphone, 64-bit video, 56KFlex faxmodem, 1.44MB floppy drive, 24X CD-ROM, Wave Table sound.

Tiger 596 Motherboard Features At-A-Glance

Form Factor: **Micro ATX**	On Board Video: **4MB PCI**	ISA Slots: **1**
Processor: **Socket 7**	On Board Audio: **YES**	Memory: **DIMM**
Bus Speed: **Up to 83MHz**	PCI Slots: **3**	Max Memory: **256 MB**

Tiger 767 AT, 760 ATX Slot 1

Micro ATX Slot 1 with 3 PCI/1 ISA

AT Slot 1 with 4 PCI/1 ISA

Motherboard & Case: Motherboard mounted in dual-cooling fan case; cables & manual

Pre-Assembled Kits: Motherboard in dual-cooling fan case; keyboard, speakers, mouse, microphone, 3D AGP video, 56KFlex faxmodem, 1.44MB floppy drive, 24X CD-ROM, Wave Table sound.

Tiger 767 Form Factor: **AT** • CPU: **Slot 1** • Bus Speed: **Up to 100 MHz** • On Board Video: **8MB AGP** • On Board Audio: **YES** • PCI Slots: **4** • ISA Slots: **1** • Memory: **DIMM** • Max Memory: **768 MB**

Tiger 760 Form Factor: **Micro AT X** • CPU: **Slot 1** • Bus Speed: **Up to 100MHz** • On Board Video: **8MB AGP** • On Board Audio: **YES** • PCI Slots: **3** • ISA Slots: **1** • Memory: **DIMM** • Max Memory: **768 MB**

Motherboard Design	Processors Supported	MOTHERBOARD ONLY Item No.	1-2 units	3+ units	MOTHERBOARD & CASE Item No.	1-2 units	3+ units	PRE-ASSEMBLED KITS Item No.	1-2 units	3+ units
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Tiger 590 AT Super Socket 7 with AGP Technology and SoundPro Sound	All **AMD** Up to K62-400; **Intel** Pentium up to 233 MMX; **IBM/Cyrix** up to MII 350	MB1-E-4A	$87.99	$79.99	BB1-E-4A Mid-tower AT case with 200-Watt power supply	$139.99	$128.99	KT1-E-4A	$229.99	$211.99
Tiger 596 Micro-ATX Socket 7 with Sound & Video; 512KB Pipelined Burst cache	All **AMD** Up to K62-266; **Intel** Pentium up to 233 MMX **IBM/Cyrix** up to MII 350	MB1-E-3A	$77.99	$69.99	BB1-E-3A Micro ATX case with 140-Watt power supply	$109.99	$99.99	KT1-E-3A	$199.99	$183.99
Tiger 767 AT Slot 1	**Celeron** up to 333MHz **Intel** Pentium II up to 450MHz	MB1-E-5A	$99.99	$91.99	BB1-E-5A AT Case 200 W Power Supply	$154.99	$142.99	KT1-E-5A	$249.99	$229.99
Tiger 760 Micro ATX Slot 1	**Celeron** up to 333MHz **Intel** Pentium II up to 450MHz	MB1-E-6A	$99.99	$91.99	BB1-E-6A Micro ATX Case 140W Supply	$139.99	$128.99	KT1-E-6A	$239.99	$220.99

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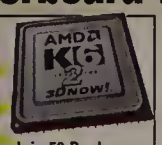

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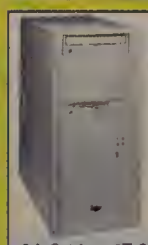

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CYY

Avoid the Desktop-to-Doorstop Blues

IF YOU SUCCUMB to PC manufacturers' hype, it's easy to believe that computers are less like toasters and more like toast: not durable goods, but perishable commodities. Can this possibly be true?

Seems that way. I bought a new car in 1987. Since then I've replaced two desktop machines, three notebooks, two modems, a printer, and a monitor, not to mention a parallel cable and minor items I've undoubtedly forgotten. The only pieces of pre-1987 computer equipment I'm still using are a serial cable and a phone cord.

The car still runs fine, and most of the PC equipment from that era probably would too, if I had it today. But the feeble memory, tiny hard disks, and inability to run modern software would make them about as useful as an eight-cylinder car with one spark plug.

Today's cheap computers add a new wrinkle to the calculation. With system prices so low, I'm tempted to simply buy a $500 PC today and replace it with another one next year. But I probably won't, mostly because Microsoft has made upgrading to a new machine so ugly that I'll do just about anything to avoid it. In the DOS days, you could buy a new system, move your old files to it with LapLink, and get back to work. Now you can spend a day or a lifetime reinstalling your software and moving your files. That's a great incentive to stand pat. So is the certain knowledge that the thoroughbred you buy tomorrow will seem like a candidate for the glue factory in a matter of weeks.

The thoroughbred you buy tomorrow will seem like a candidate for the glue factory in a matter of weeks.

MAKE OBSOLESCENCE OBSOLETE

THOUGH WINDS OF CHANGE constantly fan the computer industry, there are ways to insulate yourself from them—at least for a while. At the risk of sounding like a shill for overpriced PCs, here are my five rules for delaying the agony of upgrading:

Think fast. People rarely complain that they bought a machine that's just too darned powerful. That goes for just about every aspect of computing: I agonized over buying a 1200-bps modem instead of a 300-bps model—until I got it home and understood the difference. In retrospect, I've made the worst purchases when I've aimed low. Want a 14.4-kbps PC Card modem, cheap? I thought I did.

Think big. No matter how big the memory, the monitor, or the drive, it always seems inconceivable that you can possibly make use of it—until you actually try. People laughed when I bought my first 10MB drive; I rue the hours I've wasted clearing files from my current 2GB unit.

Run it till it drops. Once you buy a new system, ignore new models for at least two years. Upgrades sooner than that are rarely worth it. When I bought my P-90 four years ago, it was state of the art. Today it's a dog, but if I weren't in the business of writing about products that can't run on it, I'd squeeze another year out of it. Obsolescence is in the eye of the beholder.

Know when to quit. The best reason to buy a new machine is to accommodate must-have hardware or software that just won't work with the old one. But there are others. On the road, I could live with the speed of my old 486 laptop. But I couldn't live with the built-in 14.4-kbps modem, the two laptop batteries that held charges inconsistently, or the half-gig hard drive that I sometimes had to remove, slam on a desk, and reinsert. Instead of spending hundreds trying to fix these things, I put that money toward a new PC that's better in every respect.

Avoid notebooks. I know: You have to buy notebooks. I have to buy notebooks. But they're still a bad deal in the long run. Less reliable than desktops, portables are also more expensive and difficult to fix. Because they come with slower CPUs, less memory, and smaller hard drives than desktops, they have shorter useful lives even when you don't drop them onto concrete. Besides, toting a beat-up old clunker makes a statement about you and your business. If the message you want to convey is frugality, fine. If not, plan to upgrade notebooks about twice as often as desktop units.

But at least you can get a unit with a durable magnesium case. It may not last any longer, but when you replace it, you'll have a doorstop that will be the envy of your friends and colleagues.

PC World *Contributing Editor Stephen Manes has been writing about computers and their frustrations for more than 15 years. He is coauthor of* Gates, *a biography of Microsoft's chairman.* ■

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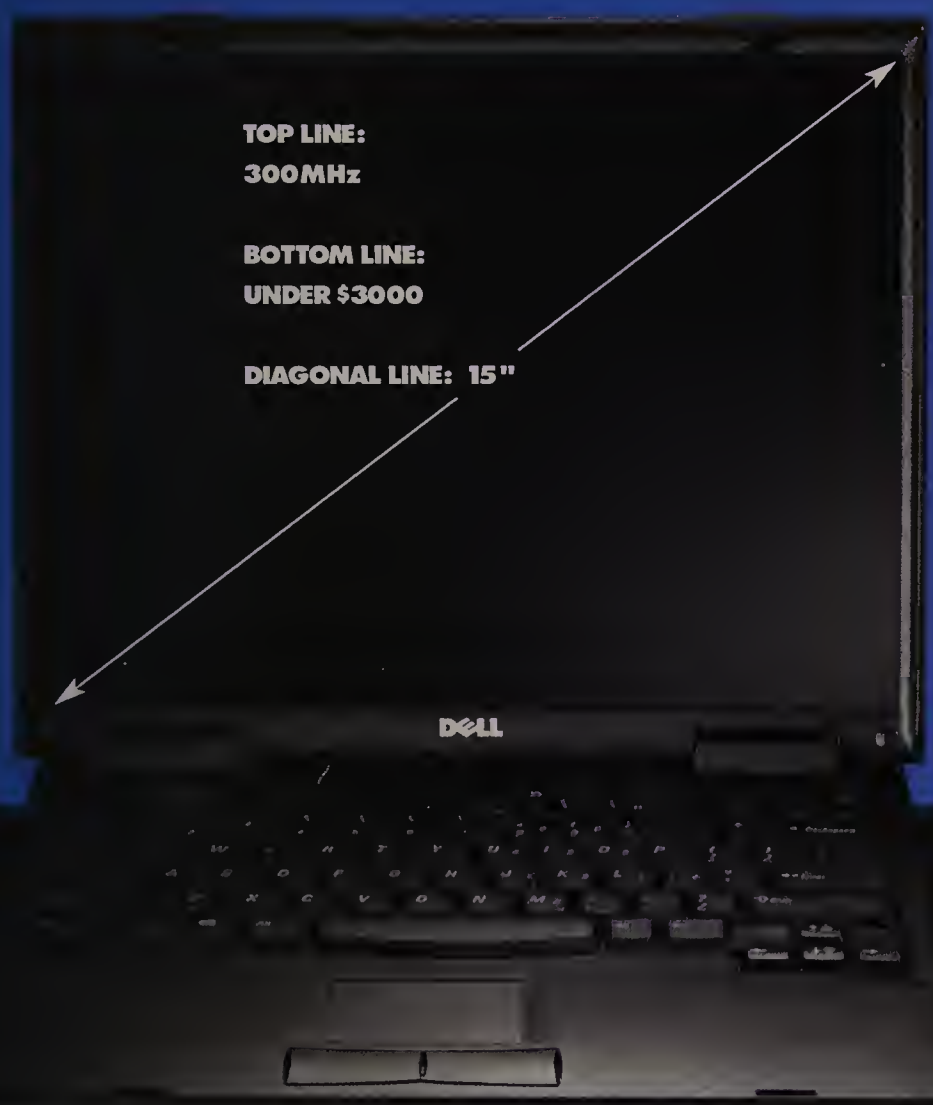

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